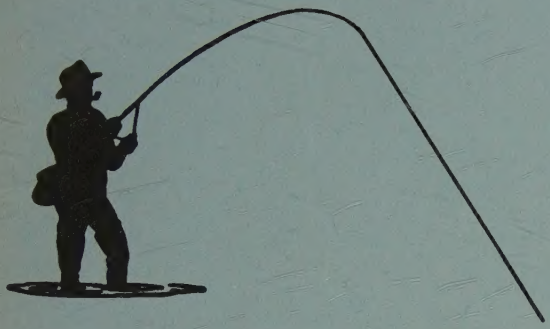
23(3)



SPORT FISHERY ABSTRACTS

LIBRARY
NOV 8 1978
FISH & WILDLIFE SERVICE

Vol. 23, No. 3, 1978

DEPARTMENT OF THE INTERIOR
U. S. FISH AND WILDLIFE SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR
CECIL D. ANDRUS, SECRETARY

Robert L. Herbst, Assistant Secretary for Fish and Wildlife and Parks
Fish and Wildlife Service, Lynn A. Greenwalt, Director

SPORT FISHERY ABSTRACTS

Roger Schoumacher, Editor
Terry N. Sexson, Assistant Editor

Editorial Office
U.S. Fish and Wildlife Service
Aylesworth Hall, CSU
Fort Collins, Colorado 80523

Sport Fishery Abstracts is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

One volume, consisting of four numbers, is issued each year. Each number contains separate Author, Geographic, and Taxonomic indexes, and the final number of each volume contains cumulative Author, Geographic, Taxonomic, and Subject indexes, and a list of publications screened. Authors who publish in journals not screened for *Sport Fishery Abstracts*, and who would like their publications included, should submit abstracts to the Editor.

The U.S. Fish and Wildlife Service assumes no responsibility for the accuracy of material from outside sources, and can only supply copies of articles written and published by the U.S. Fish and Wildlife Service.

SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 23 Number 3 1978

CONTENTS

AQUATIC PLANTS AND THEIR CONTROL 1
CULTURE AND PROPAGATION
General Fish Culture 2
Trout and Salmon Culture 2
Other Anadromous Species Culture 4
Warmwater Culture 5
Mariculture 10
Feeds, Feeding and Nutrition 12
Miscellaneous Culture Techniques and Equipment 14
LIMNOLOGY AND OCEANOGRAPHY
General 15
Benthos 15
Plankton 16
MORPHOLOGY, PHYSIOLOGY, GENETICS AND BEHAVIOR
Morphology 17
Physiology 25
Genetics, Variation Studies, Hybridization 59
Behavior 65
NATURAL HISTORY
Life Histories - General Works 74
Population Studies - Production, Standing Crop, Recruitment 83
Spawning Habits and Movements, Sex Ratios, Fecundity, etc. 87
Movements, Seasonal and Depth Distribution, etc. 92
Foods and Feeding 95
Age and Growth 104
Geographical Distribution, Fish Surveys, etc. 108
Abundance, Factors of; Survival and Mortality 117
Identification, Keys, Classification 118
PARASITES AND DISEASES
General 123
Bacterial 126
Fungal 128
Protozoan 129
Viral 132
Other 134
POLLUTION AND TOXICOLOGY
Pollution 140
Fish Kills 149
Toxicology; Bioassays 150
Fish Toxicants 169
RESEARCH AND MANAGEMENT
General 170
Administration and Planning 172
Reports of Fishery Stations, States, etc. 172
Habitat Alteration 173
Harvest, Creel Census 179
Fish Control and Removal 180
Marking and Tagging 180
Stocking and Introductions 181
Fishing Gear and Techniques 182
Fertilization of Water and Soil 184
Fishways, Fish Passage Through Dams, etc. 185
Mathematics, Statistical Methods and Modeling 186
Lake Management and Research 186
River and Stream Management and Research 187

Farm Pond and Small Impoundment Management 188
Large Impoundment Management and Research 190
Marine Management and Research 191
Reviews, Bibliographies 192
Sport Fishery Techniques 193
Water Use and Conservation 193
AUTHOR INDEX (SALMON) 195
GEOGRAPHIC INDEX (YELLOW) 221
SYSTEMATIC INDEX (BLUE) 227

Camera copy for this issue of *Sport Fishery Abstracts* has been generated by computer programs developed by the Office of Library and Information Services, U.S. Department of the Interior, Washington, D.C.

AQUATIC PLANTS AND THEIR CONTROL

78-001275 Lembi, C. A.; Ritenour, B. G.; Iverson, E. M.; Forss, E. C. THE EFFECTS OF VEGETATION REMOVAL BY GRASS CARP ON WATER CHEMISTRY AND PHYTOPLANKTON IN INDIANA PONDS. Trans. Am. Fish. Soc. 107 (1): 161-171. Jan. 1978. SFA 23(3)
[Dep. Bot. Plant Pathol., Purdue Univ., West Lafayette, IN 47907]

78-001276 Lembi, C. A.; Ritenour, B. G. THE WHITE AMUR AS A BIOLOGICAL CONTROL FOR AQUATIC WEEDS IN INDIANA. Purdue Univ. Water Resour. Res. Cent. Tech. Rep. No. 95. viii + 95p. Dec. 1977. SFA 23(3)
[Dep. Bot. Plant Pathol., Purdue Univ., West Lafayette, IN]

78-001277 Lewis, W. M. OBSERVATIONS ON THE GRASS CARP IN PONDS CONTAINING FINGERLING CHANNEL CATFISH AND HYBRID SUNFISH. Trans. Am. Fish. Soc. 107 (1): 153-155. Jan. 1978. SFA 23(3)
[Fish. Res. Lab., South. Ill. Univ., Carbondale 62901]

78-001278 Mitzner, L. EVALUATION OF BIOLOGICAL CONTROL OF NUISANCE AQUATIC VEGETATION BY GRASS CARP. Trans. Am. Fish. Soc. 107 (1): 135-145. Jan. 1978. SFA 23(3)
[Iowa Conserv. Comm., R.R. 1, Box 209, Chariton, 50049]

78-001279 Schuytema, G. S. BIOLOGICAL CONTROL OF AQUATIC NUISANCES--A REVIEW. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-77-084. viii + 90p. July 1977. SFA 23(3)
[U.S. EPA, Corvallis Environ. Res. Lab., Corvallis, OR 97330] A total of 532 references on the biological control of aquatic nuisances were reviewed. Three major control approaches exist. Grazing and predation have been the most frequently utilized techniques, with emphasis on macrophyte control by fish and insects. The use of pathogens is potentially effective, with most promise in macrophyte control. Biomanipulation, the exploitation of the interrelationships among plants, animals and their environment, is considered a most promising technique for eutrophic systems. This approach includes increasing algal grazers while controlling zooplanktivores and exploiting the competitive and growth-limiting reactions among various species. The importance of using host-specific organisms to prevent damage to desirable components of the ecosystem is emphasized.

GENERAL FISH CULTURE

78-001280 Coche, A. G. REVUE DES PRATIQUES D'ELEVAGE DE POISSONS EN CAGES DANS LES EAUX CONTINENTALES. [A REVIEW OF FISH CAGE CULTURE AS PRACTISED IN INLAND WATERS.] Aquaculture 13 (2): 157-189. Feb. 1978. In French with English summ. SFA 23(3)
[FAO of the UN, 00100 Rome, Italy]

78-001281 Hennessy, S. L. SOME POTENTIAL USES OF INDUSTRIAL WASTE WATER IN FISH CULTURE. Cal-Neva Wildl. Trans. 1977: 118-124. 1977. Copies available from The Wildlife Society, 4606 San Marino Drive, Davis, CA 95616. SFA 23(3)
[Garrapata Fisheries, Inc., Carmel, CA] The use of an industrial waste water treatment facility is examined for cultivation of ranibow trout, striped bass, and the production of aquatic crustaceans to be utilized as food for Maine lobster and fish rations. Six month survival and growth of caged rainbow trout, without supplemental feeding, was similar to values obtained at a local trout farm. The five day old striped bass larvae experienced 100 percent mortality while a three month test of juvenile Maine lobster on rations of water fleas resulted in 85 percent survival. The trout contained detectable amounts of mercury and chlorinated hydrocarbon residue with lower levels of these substances being found in the water of the cultivation pond.

78-001282 Holden, C. GOVERNMENT SEEKING WAYS TO ENCOURAGE AQUACULTURE. Science 200 (4337): 33-35. 7 Apr. 1978. SFA 23(3)

TROUT AND SALMON CULTURE

78-001283 Buyanov, N. I.; Rozhdestvenskaya, A. D.; Laptev, M. I.; Stepanova, V. D. THE USE OF THERMAL EFFLUENT FROM THE KOLA ATOMIC POWER STATION FOR THE REARING OF MARKETABLE FISH. J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.) 16 (6): 996-1000. 1976. SFA 23(3)
[PINRO, Murmansk, USSR] We describe the first positive experience of the rearing of rainbow trout (/Salmo gairdneri/) in the heated effluent of the Kola Atomic Power station. Measurements in the fish of cesium 137, one of the biologically most significant artificial radioisotopes has shown that no radioactive pollution occurs in the region investigated.

78-001284 Clarke, W. C.; Griffioen, W.; Solmie, A. A FACTORIAL MATING STUDY COMPARING THE FERTILITY OF PEN-REARED AND WILD COHO SALMON (/ONCORHYNCHUS KISUTCH/). Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 748. iii + 9p. Dec. 1977. In English with French summ. SFA 23(3)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] A 4 X 5 factorial mating experiment was performed to compare the fertility of pen-reared and wild coho salmon. Precocious and adult pen-reared males were as fertile as wild males. However, eggs from pen-reared female coho were less fertile than those from wild females. The size of both male and female parents influenced the fork length of the alevins at the end of the experiment (63 days).

78-001285 Dahlberg, M. L.; Bailey, J. E.; Pinette, W. S. EVALUATION OF THREE METHODS OF HANDLING GAMETES OF SOCKEYE SALMON FOR TRANSPORT TO INCUBATION FACILITIES. Prog. Fish-Cult. 40 (2): 71-72. Apr. 1978. SFA 23(3)
[NMFS, P.O. Box 155, Auke Bay, AK 99821]

78-001286 Fagerlund, U. H. M.; McBride, J. R. DISTRIBUTION AND DISAPPEARANCE OF RADIOACTIVITY IN BLOOD AND TISSUES OF COHO SALMON (/ONCORHYNCHUS KISUTCH/) AFTER ORAL ADMINISTRATION OF ^{3}-TESTOSTERONE. J. Fish. Res. Board Can. 35 (6): 893-900. June 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Resour. Serv. Br., West Vancouver, BC V7V 1N6, Canada]

78-001287 Johnstone, R.; Simpson, T. H.; Youngson, A. F. SEX REVERSAL IN SALMONID CULTURE. Aquaculture 13 (2): 115-134. Feb. 1978. SFA 23(3)
[Mar. Lab., P.O. Box 101, Victoria Rd., Aberdeen, AB9 8DB, Scotland]

78-001288 Poon, D. C. QUALITY OF SALMON FRY FROM GRAVEL INCUBATORS. Ph.D. dissertation, Oreg. State Univ. 269p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(3):977. Sept. 1977. SFA 23(3)

78-001289 Rimmer, D. M.; Power, G. REARING ATLANTIC SALMON (/SALMO SALAR/) IN FISHLESS LAKES OF THE MATAMEK RIVER SYSTEM, QUEBEC. Can. Field-Nat. 92 (1): 1-9. Jan.-Mar. 1978. SFA 23(3)
[Dep. Biol., Univ. New Brunswick, Fredericton, NB E3B 5A3, Canada] An attempt to utilize fishless lakes for producing smolts of Atlantic Salmon (/Salmo salar/) resulted in exceptional growth, but poor survival and no migration. On diets of zooplankton with a high proportion of larvae of Chaoboridae and Chironomidae, alevins grew at rates of 0.54-0.67 mm/day^{-1}, yearlings attained mean fork lengths of 168 mm, and 3+-year-old fish averaged 404 mm fork length. These growth rates are greater than any other recorded for Atlantic Salmon in fresh water. Condition factors were high, ranging from 1.17 to 1.60. The findings indicate that Atlantic Salmon can survive and grow well in these fishless lakes, but great care must be taken to ensure that survival is good. Also, if this potential management technique is to be successfully developed, a solution to the non-migration problem must be found.

78-001290 Sozinov, I. A. THE FEEDING OF /COREGONUS MUKSUN/ REARED IN THE LAKES OF THE FOREST-STEPPE ZONE OF TYUMEN REGION. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 72-77. 1977. SFA 23(3)
[Siberian Fish. Res. Plan. Inst., Tyumen, USSR] The feeding of second-year muksun, /Coregonus muksun/, reared in oxygen-deficient lakes of the forest-steppe zone of Tyumen region was investigated. Second-year muksun may be raised in polyculture, not as a "pure" benthos-feeder, but as a benthos-plankton consumer, since the muksun is well adapted to feeding on a variety of organisms from different ecological groups, depending on the food supply of the lakes.

78-001291 Spinelli, J.; Mahnken, C. CAROTENOID DEPOSITION IN PEN-REARED SALMONIDS FED DIETS CONTAINING OIL EXTRACTS OF RED CRAB (/PLEURONCODES PLANIPES/). Aquaculture 13 (3): 213-223. Mar. 1978. SFA 23(3)

[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] The rate of deposition of carotenoids in pen-reared coho salmon was investigated by the addition of known carotenoid levels to diets. The carotenoids added to the diets were derived from red crab (/P. planipes/), and a process is described for the preparation of a soya oil carotenoid concentrate. Using a 3-stage counter-current extraction process, extracts containing 155 mg/100 g oil were prepared from red crab (/P. planipes/). Oregon moist pellets containing 3, 6, and 9 mg carotenoid/100 g were prepared using these extracts and were fed to coho salmon (/Oncorhynchus kisutch/) for 120 days. The amount of carotenoid deposited in the flesh of the fish was related to the carotenoid content of the diet and to the weight of the fish. Fish fed diets containing 6 and 9 mg carotenoid/100 g for the same length of time contained 60 percent more flesh carotenoids than those fed 3 mg/100 g. In general, after 120 days of feeding, only those fish feeding on diets containing 6.0 and 9.0 mg carotenoid/100 g and weighing over 215 g were assessed as having good-to-excellent coloration. Analysis of the flesh showed that there was no correlation between its carotenoid and fat contents.

OTHER ANADROMOUS SPECIES CULTURE

78-001292 Bouck, G. R.; Christian, A. R.; Cairns, M. A. FEASIBILITY OF STRIPED BASS (/MORONE SAXATILIS/) CULTURE IN WELL WATER AT CORVALLIS, OREGON. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 314-322. July 1977. SFA 23(3)

[U.S. FWS, Bldg. 204 N.S.A., Seattle, WA 98115] Young of the year striped bass were moved in August 1975 from California to Oregon and were overwintered from November 1975 to May 1976 in well water (8-12 C) and heated well water (15 C). This was done as a check on chemical suitability of the water supply and its winter temperature for the culture of striped bass. In unheated well water (8-12 C) striped bass lost weight and length, and 97 percent died in the six month study period. Striped bass held at 15 C grew from an average of 4.5 g to an average of 12.5 g, increased their average standard length from 5.9 to 8.8 cm, and less than 2 percent died. Maximum average growth in this study was only about 50 percent of that achieved either by siblings which remained in

78-001293 Braid, M. R. FACTORS AFFECTING THE SURVIVAL AND GROWTH OF STRIPED BASS, /MORONE SAXATILIS/ (WALBAUM), FRY IN RECIRCULATING SYSTEMS. Ph.D. dissertation, Auburn Univ. 86p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(5):1969. Nov. 1977. SFA 23(3)

Fry grew significantly better in 38-l aquaria than in 7.6-l McDonald hatching jars, although survival rates were similar. Survival and growth rates of fry cultured in water of 5 or 10 parts per thousand salinity were not significantly different. Fry survived and grew significantly better when fed live brine shrimp than when fed Chinook Fry Starter no. 1, ground Purina Trout Chow, Tetramin fish feed, freeze-dried brine shrimp, or micro-encapsulated feed. Survival and growth rates of fry fed freshly-killed brine shrimp were not always significantly different from survival and growth rates of fry fed live brine shrimp. No significant differences in survival or growth rates were observed when fry were cultured in untreated water or in water treated with ultraviolet radiation for control of disease-causing

78-001293 CONTINUED
microorganisms, even though ultraviolet sterilization of the water resulted in at least 87 percent reduction of bacteria. The extent of positive phototropism of fry was directly related to the intensity of light, not to its wavelength. Fry were most attracted to light of moderate intensities, were unaffected by light of low intensity, and appeared to avoid light of high intensity. No difference was observed in behavior of fry exposed to light of various wavelengths. In two experiments designed to investigate extent of fry cannibalism, the average cannibalism rates for all jars were 31.29 percent and 24.17 percent of the total number of fry stocked. Cannibalism rates of fry fed live brine shrimp, freshly-killed brine shrimp, or Chinook dry feed were not statistically different.--From abstr.

78-001294 McHugh, J. J.; Heidinger, R. C. EFFECTS OF LIGHT SHOCK AND HANDLING SHOCK ON STRIPED BASS FRY. Prog. Fish-Cult. 40 (2): 82. Apr. 1978. SFA 23(3)
[Va. Comm. Game Inland Fish., 602 William St., Fredericksburg 22401]

WARMWATER CULTURE

78-001295 Chaudhuri, H.; Juario, J. V.; Primavera, J. H.; Samson, R; Mateo, R. OBSERVATIONS ON ARTIFICIAL FERTILIZATION OF EGGS AND THE EMBRYONIC AND LARVAL DEVELOPMENT OF MILKFISH, /CHANOS CHANOS/ (FORSKAL). Aquaculture 13 (2): 95-113. Feb. 1978. SFA 23(3)
[Aquacult. Dep., SEAFDC, Tigbauan, P.O. Box 256, Iloilo, Philippines] Hydrated eggs obtained from a female milkfish, /Chanos chanos/, were artificially fertilized with the milt collected from a male injected with acetone-dried pituitaries of salmon. The fertilized eggs (1.1-1.25 mm in diameter) developed normally in seawater in basins and petri dishes at a salinity of 30-34°/oo, and successfully hatched in 25-28.5 hours at a temperature of 26.4-29.9°C. The yolk was completely absorbed in about 2.5 days and during this period many postlarvae died. A few larvae were reared up to 5 days but all died on the 6th day. Attempts were made to feed the postlarvae with freshly hatched trochophore larvae of oysters obtained from eggs artificially fertilized in the laboratory.

78-001296 Davis, J. T. DESIGN OF WATER REUSE FACILITIES FOR WARM WATER FISH CULTURE. Ph.D. dissertation, Tex. A&M Univ. 109p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8):3583. Feb. 1978. SFA 23(3)
Design criteria for warm water fish culture utilizing a reuse system were developed. Standard municipal waste treatment methods were used to the maximum extent possible. A trickling filter preceded and followed by settling basins were adequate for nitrification. Primary settling basins should have a detention time of 25-30 minutes, an overflow rate less than 100 m^3/m^2-d and a depth of at least 1.3 m. solids flushed from the fish tanks required a detention time between 20 and 25 minutes, an overflow rate less than 160 m^3/m^2-d and a depth of at least 1.3 m for 80 percent removal of suspended solids. Trickling filters were recommended due to simplicity of operation. Minimum depth should be 6 feet with a hydraulic loading rate between 7.5 and 30 m^3/m^2-d. Ammonia nitrogen loading rates should not exceed 20×10^{-5} kg/m^2-d. Settling of the trickling filter effluent required a detention time of 20 minutes was adequate with an overflow rate of 175 m^3/m^2-d and a depth of at least 1.8 m for 80 percent removal of suspended solids. Fish loading rates of 50 kg/m^3 with turnover times of 0.5 hours resulted in acceptable growth, survival and food

78-001296 CONTINUED
conversion rates. Possible implications for transference of experimental results to other water quality conditons are discussed.

78-001297 Deelder, C. L. A SHORT NOTE ON THE INTENSIVE CULTURE OF EEL (/ANGUILLA ANGUILLA/ L.). Aquaculture 13 (3): 289-290. Mar. 1978. SFA 23(3)
[Netherlands Inst. Fish. Invest., P.O. Box 68, IJmuiden, The Netherlands] Preliminary experiments in intensive culture showed the possibility of raising healthy eel with obvious growth in water of moderate temperature, when fed a special diet.

78-001298 Dunseth, D. R. POLYCULTURE OF CHANNEL CATFISH /ICTALURUS PUNCTATUS/, SILVER CARP /HYPOPHTHALMICHTHYS MOLITRIX/, AND THREE ALL-MALE TILAPIAS /SARATHERODON/ SPP. Ph.D. dissertation, Auburn Univ. 62p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8), Feb. 1978. SFA 23(3)
This research compared fish production, oxygen concentrations, and phytoplankton communities in 0.04 ha, earthen ponds stocked with the following fishes: catfish only; catfish and tilapia; catfish and silver carp; catfish, tilapia, and silver carp. A market study was conducted with catfish, tilapia, and silver carp to assess the economic feasibility of polyculture and to determine consumer demand and acceptance of tilapia and silver carp. Catfish production was lower in the presence of tilapia and slightly higher in the presence of silver carp. Catfish production with both tilapia and silver carp present was similar to that in monoculture, 2576 kg/ha. Total net fish production increased from 2635 kg/ha in the monoculture treatment to 4576 kg/ha in one polyculture treatment. Net tilapia production averaged 837 kg/ha and net silver carp production averaged 1040 kg/ha. There was no apparent competition between tilapia and silver carp at these production levels. During the final month of the growing season mean weekly oxygen concentrations at daybreak were significantly higher (P=.05) and the occurrence of aeration was considerably lower in treatments stocked with silver carp than in monoculture. Polyculture did not permit higher feeding rates and a significant increase in catfish production without an increase in the occurrence of aeration and a decrease in early morning oxygen concentrations. Green algae were dominant in treatments stocked with silver carp and blue-green algae were dominant in treatments not containing silver carp. During August-September phytoplankton volumes were significantly lower (P=.05) and phytoplankton diversities were significantly higher (P=.05) in polyculture treatments. Net incomes were $347-$820 /ha ($139-$328/a) higher in polyculture treatments. Consumer acceptance and demand were excellent for tilapia and fair for silver carp.

78-001299 Guerrero, R. D. III; Guerrero, L. A. CULTURE OF /TILAPIA NILOTICA/ AND /MACROBRACHIUM/ SPECIES SEPARATELY AND IN COMBINATION IN FERTILIZED FRESHWATER FISHPONDS. Philipp. J. Fish. 14 (2): 232-235. July-Dec. 1976. SFA 23(3)
[Freshwater Aquacult. Cent., Central Luzon State Univ., Munoz, Nueva Ecija 2320, Philippines] /Tilapia nilotica/ and shrimps of the /Macrobrachium/ species, separately and in combination, were stocked in 15 0.1 ha fertilized earth ponds. Yield of /T. nilotica/ in ponds stocked with 5 kg/ha adult shrimps increased by 21 percent over that of ponds with /T. nilotica/ only. Presence of the shrimps also increased the total yield of polyculture ponds by 22 percent compared to that of monoculture ponds with /T. nilotica/ alone. The shrimps apparently contributed substantially to the natural diet of /T. nilotica/. Adult shrimps stocked at 5 kg/ha yielded more than juveniles stocked at 10 kg/ha in monoculture and polyculture ponds.

78-001300 Holt, R. S., Jr. CULTURE OF FISH IN CAGES AND THEIR USE AS BIOLOGICAL MONITORS OF WATER QUALITY WITHIN HEATED DISCHARGE WATERS OF A POWER STATION. Ph.D. dissertation, Tex. A&M Univ. 405p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8):3586. Feb. 1978. SFA 23(3)

78-001301 Lazareva, L. P.; Omarov, M. O.; Lezina, A. N. FEEDING AND GROWTH OF THE BIGHEAD, /ARISTICHTHYS NOBILIS/, IN THE WATERS OF DAGESTAN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 65-71. 1977. SFA 23(3)
[Caspian Fish. Res. Inst., Makhockhala, USSR] The main component of the food of the larvae of the bighead /Aristichthys nobilis/, was zooplankton, but its role decreases with the age of the fish, while the role of phytoplankton increases. In view of the paucity of zooplankton in the waters studied, underyearlings and yearlings were in most cases poorly supplied with food and sometimes changed entirely to feeding on phytoplankton and detritus. Detritus constituted 82-98 percent of the weight of the food.

78-001302 Lewis, W. M.; Yopp, J. H.; Schramm, H. L., Jr.; Brandenberg, A. M. USE OF HYDROPONICS TO MAINTAIN QUALITY OF RECIRCULATED WATER IN A FISH CULTURE SYSTEM. Trans. Am. Fish. Soc. 107 (1): 92-99. Jan. 1978. SFA 23(3)
[Fish Res. Lab., South. Ill. Univ., Carbondale 62901]

78-001303 Lu, J. D. A RECIRCULATING AQUACULTURE SYSTEM. Bamidgeh 30 (1): 12-22. Mar. 1978. SFA 23(3)
[Dep. Civ. Eng., Carnegi Mellon Univ., 5000 Forbes Ave., Pittsburgh, PA 15213] A recirculating system for warm water species, using reconditioned water was designed. Channel catfish, /Ictalurus punctatus/, was selected for testing the system which contained a total volume of 1500 litres and was composed of a fish tank, filters, and aeration and pumping units. Two groups of fish were used as controls in a once flow-through system. The control-1 group and the experimental group had the same loading rate; that of control-2 group was twice as high. The mean initial weight for all three groups of fish was 24.8 g. After six months, the mean final weights in the recirculating system and controls-1 and -2 were 150.0 g, 153.4 g, and 186.6 g, respectively. The mean final weight of the fish in control-2 group was significantly higher ($p=0.10$) than that of the other two groups. Pertinent parameters of water chemistry were measured including ammonia (NH(3)-N) and nitrate (NO(3)-N) content. Water quality appeared to be satisfactory in all three groups. Gill damage ("aneurism" and lamellar fusion) was found predominantly in control-2 and to a lesser extent in the other two groups.

78-001304 McCord, C. L., Jr.; Loyacano, H. A., Jr. REMOVAL AND UTILIZATION OF NUTRIENTS BY CHINESE WATERCHESTNUT IN CATFISH PONDS. Aquaculture 13 (2): 143-155. Feb. 1978. SFA 23(3)
[Enwright Assoc., P.O. Box 1180, Summerville, SC 29483] The effect of Chinese waterchestnut (/Eleocharis dulcis/) on production of channel catfish (/Ictalurus punctatus/) and resulting water quality were studied in 1975 in 0.04-ha earthen ponds at Clemson University. Ponds containing waterchestnut had significantly lower levels of nitrate nitrogen and ammonia nitrogen. These lower nutrient levels resulted in lower phytoplankton levels in ponds with waterchestnut. Data indicated that Chinese waterchestnut had no effect on channel catfish production. Poor fish survival may have prevented detection of

78-001304 CONTINUED
any effect of waterchestnut on catfish production. Chinese waterchestnut removed nutrients from the pond water. Mean nutrient removal per ha for the 201-day growing season was 108.06 kg of nitrogen, 6.90 kg of calcium, and 37.46 kg of magnesium. Mean corm production was 4664 kg per ha. These data indicate that Chinese waterchestnut should remove nutrients in sufficient quantities to improve water quality and allow increases in feeding rates and greater catfish production.

78-001305 Merkowsky, A. J.; Handcock, A. J.; Newton, S. H. ATTRACTION OF AERIAL INSECTS AS A FISH FOOD SUPPLEMENT. Proc. Ark. Acad. Sci. 31: 75-76. 1977. SFA 23(3)
[Resour. Div., Rodale Press, Inc., Emmaus, PA 18049] Insect populations over a 1.2 hectare southeast Arkansas livestock pond were sampled to consider the possibility of their use as a fish food supplement. A commercial insect attraction unit was suspended above the pond, and attracted insects were collected. Insect populations were sampled 3-4 nights each month, January-December, 1976. Insects collected were identified and analyses were performed to determine nutritional composition and pesticide content. Insect samples were variable, however, 62 percent of the insects identified were in the Order Diptera and 97 percent of these were in the Family Chironomidae. Nutritional analyses revealed insects were more than 60 percent crude protein. Pesticide analysis indicated 0.98 ppm toxaphene was present in the insects.

78-001306 Newton, S. H.; Merkowsky, A. J.; Handcock, A. J.; Meisch, M. V. MOSQUITOFISH, /GAMBUSIA AFFINIS/ (BAIRD AND GIRARD) PRODUCTION IN EXTENSIVE POLYCULTURE SYSTEMS. Proc. Ark. Acad. Sci. 31: 77-78. 1977. SFA 23(3)
[USDA, Univ. Ark., Pine Bluff] During 1976, mosquitofish, /Gambusia affinis/ Baird and Girard, were reared in combination with food and game fishes in 0.1 ha culture ponds at the University of Arkansas at Pine Bluff fisheries research facility. Mosquitofish production was 218 kg/ha, with 1683 fish per kilogram, in ponds that were also stocked with channel catfish, /Ictalurus punctatus/ Rafinesque, bigmouth buffalo, /Ictiobus cyprinellus/ Valenciennes, grass carp, /Ctenopharyngodon idella/ Valenciennes, and silver carp, /Hypophthalmichthys molitrix/ Valenciennes. In another similar stocked pond, hybrid sunfish fingerlings depressed mosquitofish yield by 79 percent. No mosquitofish production was obtained in ponds stocked with 250 largemouth bass, /Micropterus salmoides/ Lacepede, fry per hectare, although fathead minnows, /Pimephales promelas/ Rafinesque, were added to buffer mosquitofish predation. Total fish yields ranged from 414 to 670 kg/ha for the polyculture systems investigated.

78-001307 Pennington, C. H. CAGE CULTURE OF CHANNEL CATFISH, /ICTALURUS PUNCTATUS/ (RAFINESQUE), IN A THERMALLY MODIFIED TEXAS RESERVOIR. Ph.D. dissertation, Texas A&M Univ. 122p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8):3484. Feb. 1978. SFA 23(3)
Channel catfish were reared during 1973 and 1974 in 1.0 m^3 cages suspended in the intake canal of Trinidad Lake, a cooling reservoir for the Texas Power and Light Company's Steam Electric Generating Station at Trinidad, Texas. There was an increase in net production and coefficient of variation in length as stocking density increased. As stocking levels increased, there was a corresponding decrease in feed efficiency, mean fish weight, and percentage of harvestable-size fish. Survival was not affected by number of fish per cage. Stocking densities of 600-650 fish per cage appeared to be the most economical of any density tested. Net production and survival were not different

78-001307 CONTINUED
among cages of fish fed 36.0 and 40.0 percent dietary protein levels. More efficient food conversions and greater mean fish weights were obtained using the higher protein ration. When amount fed was adjusted at 1, 4, and 7 day intervals rather than 10 and 14 day intervals, net production and mean weight per fish increased. Food conversions were more efficient for caged fish when amount fed was adjusted at 10 and 14 day intervals. More efficient utilization of food was obtained in cages of fish when feeding levels were adjusted using an expected food conversion of 1.60. Net production and mean weight per fish were greatest when amount fed to caged fish was adjusted using an expected food conversion of 1.25. Agonistic behavior among fish resulted in the physical disruption of epidermal layers and surrounding muscle tissue and caused extensive fish mortality in some cages. Fish culture activities increased organic content of the reservoir water and attracted large numbers of native fishes. Trinidad Lake appears unsuitable for economical channel catfish culture because of temperatures to high for

78-001308 Romanenko, V. D.; Vesel'skiy, S. P.; Yevtushenko, N. Yu.; Tereshchenko, M. I. GROWTH ACCELERATION IN THE CARP, /CYPRINUS CARPIO/, BY MEANS OF ION ACTIVATION OF CABOXYLATION PROCESSES. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 169-173. 1977. SFA 23(3)
[Inst. Hydrobiol., USSR Acad. Sci., Kiev, USSR]

78-001309 Rubtsov, V. V. THE EFFECT ON WILD CARP (/CYPRINUS CARPIO/) EGG MEMBRANES OF DEGUMMING WITH PAS-G AND TANNIN. J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.) 16 (6): 1028-1032. 1976. SFA 23(3)
[IEMEZh, Moscow, USSR] In the degumming of eggs in a solution of PAS-G preparation the outer membrane of the eggs is powdered with particles of the degumming substance, becomes somewhat translucent, roughened and mottled. When the PAS-G preparation and tannin are used to degum wild carp eggs it is not only the outer surface of the eggs that is modified; the membrane pores also become obstructed. When eggs are degummed in PAS-G preparation egg diameter is consideralby enlarged and the period for which the egg membranes remain adhesive is prolonged.--Concl.

78-001310 Tal, S.; Ziv, I. CULTURE OF EXOTIC SPECIES IN ISRAEL. Bamidgeh 30 (1): 3-11. Mar. 1978. SFA 23(3)
[Minist. Agric., Fish. Dep., Tel-Aviv, Israel]

78-001311 Ueda, H.; Takahashi, H. PROMOTION OF OVARIAN MATURATION ACCOMPANIED WITH OVULATION AND CHANGES OF PITUITARY GONADOTROPHS AFTER OVULATION IN THE LOACH, /MISGURNUS ANGUILLICAUDATUS/, TREATED WITH CLOMIPHENE CITRATE. Bull. Fac. Fish. Hokkaido Univ. 28 (3): 106-117. Aug. 1977. SFA 23(3)
[Lab. Fresh-Water Fish-Cult., Fac. Fish., Hokkaido Univ., Japan]

78-001312 Ueda, H.; Takahashi, H. PROMOTION BY CLOMIPHENE CITRATE OF GONADAL DEVELOPMENT AND BODY GROWTH IN IMMATURE AND MATURING GOLDFISH, /CARASSIUS AURATUS/. Bull. Fac. Fish. Hokkaido Univ. 28 (4): 181-192. Nov. 1977. SFA 23(3)
[Lab. Fresh-Water Fish-Cult., Fac. Fish., Hokkaido Univ., Japan]

MARICULTURE

78-001313 Parker, N. C. CULTURE OF SELECTED ESTUARINE ORGANISMS AND MONITORING OF WATER QUALITY IN FLOW-THROUGH TANKS RECEIVING POWER-PLANT EFFLUENT. Ph.D. dissertation, Tex. A&M Univ. 404p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8):3516. Feb. 1978. SFA 23(3)

78-001314 Pease, B. C. THE EFFECT OF ORGANIC ENRICHMENT FROM A SALMON MARICULTURE FACILITY ON THE WATER QUALITY AND BENTHIC COMMUNITY OF HENDERSON INLET, WASHINGTON. Ph.D. dissertation, Univ. Wash. 157p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(3):1036. Sept. 1977. SFA 23(3)
The effect of fish excretion and respiration at a salmon mariculture facility on the local water quality was evaluated. In the immediate vicinity of the facility, dissolved oxygen concentrations were consistently depressed while ammonia concentrations were increased, but neither effect was significant based on accepted criteria. The mariculture facility had no apparent effect on the local phytoplankton population. Major fluctuations in the local water quality were a result of natural hydrographic conditions and phytoplankton activity. The effect of fish feces and excess fish food from the mariculture facility on the benthic environment was also evaluated. There was a definite accumulation of organic matter under and extending at least 15 m from the salmon pens. This organic accumulation caused significant changes in the structure of the benthic epifaunal and infaunal communities. The benthic infauna community under the salmon pens declined in species richness and became numerically dominated by the polychaete worm, /Capitella capitata/, a well-known ubiquitous indicator of organic pollution. Therefore, the mariculture facility would have little or no effect on the marine environment if the settleable solids were collected and removed, or dispersed in such a way that there was no accumulation in the underlying sediments.--From abstr.

78-001315 Rabanal, H. R. MANGROVE AND THEIR UTILIZATION FOR AQUACULTURE. Philipp. J. Fish. 14 (2): 191-203. July-Dec. 1976. SFA 23(3)
[FAO/UNDP South China Sea Fish. Dev. Coord. Prog., Manila, Philippines]

78-001316 Ramamurthy, S.; Dhulkhed, M. H. AVAILABILITY OF SEEDS OF /SILLAGO SIHAMA/ FOR FARMING ALONG SOUTH KANARA COAST. Indian J. Fish. 22 (1,2): 283-284. 1975. SFA 23(3)
[Mangalore Res. Cent. C.M.F.R. Inst., Mangalore, India]

78-001317 Shackley, S. E.; King, P. E. A STERILE SEA WATER CIRCULATING SYSTEM FOR THE JAR CULTURE OF DEVELOPING FISH EGGS. J. Fish Biol. 12 (3): 235-237. Mar. 1978. SFA 23(3)

[Dep. Zool., Univ. Coll. Swansea, Singleton, Swansea, England] A sterile sea water circulating system for the jar culture of developing fish eggs is described. An ultra-violet filter unit is used to sterilise the water and the system is one of a double-circulation the advantages of which are discussed. This is an effective method for maintaining the developing embryos of /Blennius pholis/ L. under controlled conditions, and would be applicable to studies on other demersal fish species or marine organisms.

78-001318 Soin, S. G. THE SIGNIFICANCE OF RESEARCH ON EGG AND LARVAL DEVELOPMENT OF MARINE FISHES IN RELATION TO INTENSIFICATION OF MARICULTURE. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 245-252. 1977. SFA 23(3)

[Dep. Ichthyol., Moscow Univ., USSR] The role of aquaculture in the further development of the fishing industry of the country is discussed. The importance of the study of ecological-morphological principles of marine fishes is emphasized. The adaptive reproductive features of fishes from different ecological groups, characterized by specific conditions of the environemnt must be taken into account when such fishes are artificially propagated.

78-001319 Struhsaker, J. W.; Baldwin, W. J.; Murphy, G. I. ENVIRONMENTAL FACTORS AFFECTING STRESS AND Univ. Hawaii Sea Grant Tech. Rep. UNIHI-SEAGRANT-TR-75-02. viii + 124p. Feb. 1975. SFA 23(3)

Nehu (/Stolephorus purpureus/) is the primary baitfish in the Hawaiian skipjack tuna fishery. The purpose of this study was to increase fishing efficiency by reducing baitfish mortality and time spent baiting. The following biological and technicological factors were examined for their effect on nehu mortality: salinity, aeration, oxygen, temperature, current, light, tank color, recirculated reduced salinity, buffers, protein skimmer, density, food, disease, and predation. Time of bait capture (night or day) was also examined. A study of these factors and their effect on survival was made during capture and transfer to bait wells, in experimental laboratory tanks, in bait wells on an experimental barge, and in bait wells of commercial vessels while at sea. Results of these studies were applied in designing and testing improved live bait holding facilties. The experiments demonstrated that reduced handling of nehu following capture plus modifications to the live bait wells will significantly reduce nehu mortalities and improve the efficiency of the fishery.

78-001320 Tormosova, I. D. EXPERIMENTS ON THE INCUBATION OF EGGS OF THE NORTH SEA HADDOCK, /MELANOGRAMMUS AEGLEFINUS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 160-163. 1977. SFA 23(3)

[AtlantNIRO, Kaliningrad, USSR]

FEEDS, FEEDING AND NUTRITION

78-001321 Adron, J. W.; Mackie, A. M. STUDIES ON THE CHEMICAL NATURE OF FEEDING STIMULANTS FOR RAINBOW TROUT, /SALMO GAIRDNERI/ RICHARDSON. J. Fish Biol. 12 (4): 303-310. Apr. 1978. SFA 23(3)
[Inst. Mar. Biochem., Natl. Environ. Res. Council, Aberdeen AB1 3RA, Scotland]

78-001322 Chuapoehuk, W. NUTRITIONAL CONTRIBUTION OF NATURAL POND ORGANISMS TO CHANNEL CATFISH GROWTH IN INTENSIVELY-FED PONDS. Ph.D. dissertation, Auburn Univ. 66p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8):3482. Feb. 1978. SFA 23(3)
Nine 0.04-hectare earthen ponds at the Auburn University Fisheries Research Unit, Auburn, Alabama, were each stocked with 250 fingerling channel catfish on April 24. Three of the ponds received supplemental feed at a conventional rate for 180 days; three ponds received a preparation representing the unassimilated nutrients that the fed ponds received, but in a powder form the fish could not consume; and three ponds received no nutrients. In addition, channel catfish confined to cages were fed the same supplemental feed as the pond-fed fish. Channel catfish in the ponds receiving no nutrients gained 3.9 percent as much as the fish fed supplemental feed. The fish in the ponds receiving unassimilated nutrients gained 8.3 percent as much as the fed fish. The fish fed in cages gained 91 percent as much as the fish fed in ponds. Pond-fed channel catfish showed a sigmoid growth curve. The fish in ponds receiving unassimilated nutrients or no nutrients had almost linear growth rates, which indicated a constant availability of pond organisms to the fish throughout most of the growing season.--From abstr.

78-001323 Dabrowski, K.; Dabrowska, H.; Grudniewski, C. A STUDY OF THE FEEDING OF COMMON CARP LARVAE WITH ARTIFICIAL FOOD. Aquaculture 13 (3): 257-264. Mar. 1978. SFA 23(3)
[Inst. Ichthiobiol. Fish., Acad. Agric. Technol., Olsztyn-Kortowo, Poland] Common carp larvae were reared on artificial diets from hatching to 25 days old. The main components used in the diets were freeze/dried spleen, fish protein and chicken egg yolk. Free amino acids and bovine trypsin were added and the diet was made alkaline. All diets were gelatinized with agar to give a final dry matter content (15-20 percent) similar to that of zooplankton. Growth of larvae was negligible but survival was from 11 to 40 percent. Feeding on days 1, 2 and 3 with zooplankton and subsequently on an artifical diet (40 percent lyophilised egg yolk, 40 percent blood meal) showed some improvement both in growth and survival.

78-001324 Hilton, J. W.; Cho, C. Y.; Slinger, S. J. EFFECT OF GRADED LEVELS OF SUPPLEMENTAL ASCORBIC ACID IN PRACTICAL DIETS FED TO RAINBOW TROUT (/SALMO GAIRDNERI/). J. Fish. Res. Board Can. 35 (4): 431-436. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Nutr., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

78-001325 Kanid'yev, A. N.; Sklyarov, V. Ya. A STUDY OF THE EFFECTIVENESS OF GRANULATED FEEDS BASED ON VEGETABLE PROTEIN WITH ADDED SYNTHETIC AMINO ACIDS FOR RAINBOW TROUT (/SALMO GAIRDNERI/). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 464-470. 1977. SFA 23(3)
[VNIIPRKh, Rybnoye Postal Dist., Moscow Province, USSR] With the object of reducing the cost of high quality granulated feeds for rainbow trout (/Salmo gairdneri/) trials were conducted on the replacement of animal protein of fish meal by vegetable protein from sunflower seed meal and hydrolysate yeast. The resulting deficiency of the principal essential amino acids (lysine and methionine) was compensated by their synthetic analogs. It was established that when two thirds of the animal protein was replaced by vegetable protein and when 1.4 percent of lysine and 0.3 percent of methionine were added growth did not change, while the expenditure of animal protein was halved, and the cost of a unit of increment was reduced by 22 percent.

78-001326 Lovell, R. T.; Lim, C. VITAMIN C IN POND DIETS FOR CHANNEL CATFISH. Trans. Am. Fish. Soc. 107 (2): 321-325. Mar. 1978. SFA 23(3)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830]

78-001327 Ogino, C.; Cowey, C. B.; Chiou, J.-Y. LEAF PROTEIN CONCENTRATE AS A PROTEIN SOURCE IN DIETS FOR CARP AND RAINBOW TROUT. Bull. Jpn. Soc. Sci. Fish. 44 (1): 49-52. Jan. 1978. SFA 23(3)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo, Japan]

78-001328 Papoutsoglou, S. E.; Papaparaskeva-Papoutsoglou, E. G. COMPARATIVE STUDIES ON BODY COMPOSITION OF RAINBOW TROUT (/SALMO GAIRDNERI/ R.) IN RELATION TO TYPE OF DIET AND GROWTH RATE. Aquaculture 13 (3): 235-243. Mar. 1978. SFA 23(3)
[Dep. Appl. Hydrobiol., Agric. Univ. Coll. Athens, Greece]

78-001329 Randolph, K. N.; Clemens, H. P. EFFECTS OF SHORT-TERM FOOD DEPRIVATION ON CHANNEL CATFISH AND IMPLICATIONS FOR CULTURE PRACTICES. Prog. Fish-Cult. 40 (2): 48-50. Apr. 1978. SFA 23(3)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830]

78-001330 Reinitz, G. L.; Orme, L. E.; Lemm, C. A.; Hitzel, F. N. FULL-FAT SOYBEAN MEAL IN RAINBOW TROUT DIETS. Feedstuffs 50 (3): 23-24. 16 Jan. 1978. SFA 23(3)
[U.S. FWS, Diet Dev. Cent., Spearfish, SD 57783]

78-001331 Sakamoto, S.; Yone, Y. EFFECT OF DIETARY PHOSPHORUS LEVEL ON CHEMICAL COMPOSITION OF RED SEA BREAM. Bull. Jpn. Soc. Sci. Fish. 44 (3): 227-229. Mar. 1978. SFA 23(3)
[Fish. Res. Lab., Kyushu Univ., Tsuyazaki, Fukuoka, 811-33, Japan]

78-001332 Sakamoto, S.; Yone, Y. REQUIREMENT OF RED SEA BREAM FOR DIETARY IRON--II. Bull. Jpn. Soc. Sci. Fish. 44 (3): 223-225. Mar. 1978. SFA 23(3)
[Fish. Res. Lab., Kyushu Univ., Tsuyazaki, Fukuoka, 811-33, Japan]

78-001333 Sen, P. R.; Rao, N. G. S.; Ghosh, S. R.; Rout, M. OBSERVATIONS ON THE PROTEIN AND CARBOHYDRATE REQUIREMENTS OF CARPS. Aquaculture 13 (3): 245-2559 Mar. 1978. SFA 23(3)
[Freshwater Fish Cult. Div., Cent. Inland Fish. Res. Substn., Cuttack, India] A series of experiments was conducted with purified test diets to ascertain the optimum levels of protein and carbohydrate needed in carp feed, the details of which are indicated. Both by direct inference and by statistical analysis, it was observed that the optimum growth of carp spawn, fry and fingerlings was reached with test diets having 45 percent protein (casein) and 26 percent carbohydrate (dextrin).

78-001334 Venkatesh, B.; Shetty, H. P. C. STUDIES ON THE GROWTH RATE OF THE GRASS CARP /CTENOPHARYNGODON IDELLA/ (VALENCIENNES) FED ON TWO AQUATIC WEEDS AND A TERRESTRIAL GRASS. Aquaculture 13 (1): 45-53. Jan. 1978. SFA 23(3)
[Univ. Agric. Sci., Coll. Fish., Mangalore-575002, India] The growth rate of grass carp fed with hybrid napier was found to be nearly three times the growth attained with /Hydrilla/ and about five times the growth attained with /Ceratophyllum/. The gross conversion ratio on fresh weight basis with hybrid napier was on average 26.99:1 while with /Hydrilla/ and /Ceratophyllum/ it was 93.98:1 and 128.43:1 respectively. The average net production of grass carp fed on hybrid napier worked out to 1579.3 kg/ha in 182 days.

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

78-001335 Almazan, G. de J. EVALUATION OF THE SECCHI DISK AS AN INDEX OF PLANKTON DENSITY IN FISH PONDS. Ph.D. dissertation, Auburn Univ. 57p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8), Feb. 1978. SFA 23(3)
Sechi disk visibility is apparently a valid indicator of plankton density if plankton is the major source of turbidity. If turbidity is primarily caused by suspended soil particles or humic substances, the Secchi disk measurement is an erroneous index of plankton abundance.--From abstr.

78-001336 Chervinski, J. THE USE OF COARSE TABLE SALT IN ACCLIMATIZATION OF /LIZA AURATA/ (RISSO) AND /CHELON LABROSUS/ (RISSO) (=/MUGIL CHELO/) TO FRESH WATER. Bamidgeh 30 (1): 23-24. Mar. 1978. SFA 23(3)
[Fish Aquacult. Res. Stn., Dor, Israel]

78-001337 Cripe, C. R.; Stokes, B. E. DEVICE TO DETECT POTENTIALLY DANGEROUIS ELECTRICAL CURRENTS IN SALTWATER HOLDING TANKS. Prog. Fish-Cult. 40 (2): 74-75. Apr. 1978. SFA 23(3)
[Fac. Biol., Univ. West Fla., Pensacola 32504]

78-001338 Crunkilton, R.; LeGrande, W. LOW-COST, LARGE-VOLUME AIR SUPPLY FOR EXPERIMENTAL TANKS. Prog. Fish-Cult. 40 (2): 75-76. Apr. 1978. SFA 23(3)
[Mus. Zool., Ohio State Univ., Columbus 43210]

78-001339 Halligan, B. J.; Eaton, J. G. SURVIVAL AND REPRODUCTION OF /GAMMARUS LACUSTRIS/ AND /G. PSEUDOLIMNAEUS/ UNDER TWO EXPERIMENTAL CONDITIONS. Prog. Fish-Cult. 40 (2): 59-62. Apr. 1978. SFA 23(3)
[U.S. EPA, Environ. Res. Lab., 6201 Congdon Blvd., Duluth, MN 55804]

78-001340 Theis, G. L. TRANSFER OF HATCHERY FISH THROUGH A SEMIPERMANENT IRRIGATION PIPE SYSTEM. Prog. Fish-Cult. 40 (2): 76-77. Apr. 1978. SFA 23(3)
[Fish. Cult. Dev. Cent., Lamar Natl. Fish Hatchery, Lamar, PA 16848]

GENERAL LIMNOLOGY AND OCEANOGRAPHY

78-001341 Meyerhoff, R. D.; Larson, G. L.; Davis, G. E. PALEOLIMNOLOGY AND PRODUCTIVITY OF THREE OREGON LAKES. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 358. July 1977. SFA 23(3)
[Oak Creek Lab. Biol., Dep. Fish. Wildl., Oreg. State Univ., Corvallis]

78-001342 Samuelson, D. F. WATER QUALITY: WESTERN FISH TOXICOLOGY STATION AND WESTERN OREGON RIVERS. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-76-077. Sept. 1976. SFA 23(3)
[West. Fish Toxicol. Stn., Corvallis, OR 97330]

BENTHOS

78-001343 Bradt, P. T. SEASONAL DISTRIBUTION OF BENTHIC MACROINVERTEBRATES IN AN EASTERN PENNSYLVANIA TROUT STREAM. Proc. Pa. Acad. Sci. 51 (2): 109-111. 1977. SFA 23(3)
[Dep. Biol., Lafayette Coll., Easton, PA 18042]

78-001344 Cadwallader, P. L.; Eden, A. K. EFFECT OF A TOTAL SOLAR ECLIPSE ON INVERTEBRATE DRIFT IN SNOBS CREEK, VICTORIA. Aust. J. Mar. Freshwater Res. 28 (6): 799-805. Dec. 1977. SFA 23(3)
[Minist. Conserv., Snobs Creek Freshwater Fish. Res. Stn., Private Bag 20, Alexandra, Victoria, Australia 3714] The effect of the total solar eclipse of 23 October 1976 on invertebrate drift in Snobs Creek, Victoria, was investigated by taking hourly drift samples in two drift nets between 1300 and 2000 h (Eastern Standard Time) on 22, 23 and 24 October. /Paramoera fontana/ (Amphipoda) and terrestrial arthropods exhibited no pattern in their occurrences in the drift. Nymphs of Baetidae (Ephemeroptera) and /Trinotoperla/ (Plecoptera) were rarely found in the drift except after sunset, but exhibited no increase related to the eclipse. Four taxa, namely helodid (Coleoptera) larvae, the larvae of two species of Leptoceridae and one species of /Conoesucus/ (Trichoptera), were more abundant in the drift after sunset and also exhibited and eclipse-related increase in abundance in the drift. /Cricotopus/ (Diptera) larvae were less abundant in the drift after sunset and also exhibited an eclipse-related decrease in abundance in the drift. The results suggest that light intensity has an effect on the occurrence in the drift not only of dark-active invertebrates but also of some light-active invertebrates.

78-001345 Kovalak, W. P. EFFECTS OF A POOL ON STREAM INVERTEBRATE DRIFT. Am. Midl. Nat. 99 (1): 119-127. Jan. 1978. SFA 23(3)
[Dep. Biol., Allegheny Coll., Meadville, PA 16335]

78-001346 Kovalak, W. P. RELATIONSHIPS BETWEEN SIZE OF STREAM INSECTS AND CURRENT VELOCITY. Can. J. Zool. 56 (2): 178-186. Feb. 1978. In English with French summ. SFA 23(3)
[Dep. Biol., Allegheny Coll., Meadville, PA 16335]

78-001347 Suter, P. J.; Williams, W. D. EFFECT OF A TOTAL SOLAR ECLIPSE ON STREAM DRIFT. Aust. J. Mar. Freshwater Res. 28 (6): 793-798. Dec. 1977. SFA 23(3)
[Dep. Zool., Univ. Adelaide, G.P.O. Box 498, Adelaide, South Australia 5001] Stream drift was recorded in the Acheron River, Victoria, on 23 October 1976. A total solar eclipse occurred at 1640-1643 h (Eastern Standard Time). No noticeable effect on the number or types of animals drifting was observed.

78-001348 Swanson, G. A. FUNNEL TRAP FOR COLLECTING LITTORAL AQUATIC INVERTEBRATES. Prog. Fish-Cult. 40 (2): 73. Apr. 1978. SFA 23(3)
[North. Prairie Wildl. Res. Cent., Jamestown, ND 58401]

PLANKTON

78-001349 Ayers, R. W.; Treacy, D. H. SUBMERGED PERIPHYTON SAMPLER. Prog. Fish-Cult. 40 (2): 81. Apr. 1978. SFA 23(3)
[Va. State Water Control Board, Richmond 23230]

78-001350 Brodie, P. F. ALTERNATIVE SAMPLING DEVICE FOR AQUATIC ORGANISMS. J. Fish. Res. Board Can. 35 (6): 901-902. June 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Mar. Ecol. Lab., Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

78-001351 Carpenter, G. F. IMPROVED PLANKTON NET BUCKET. Prog. Fish-Cult. 40 (2): 80. Apr. 1978. SFA 23(3)
[NALCO Environ. Sci., Northbrook, IL 60062]

MORPHOLOGY

78-001352 Bhattacharyya, T. K.; Butler, D. G. FINE STRUCTURE OF THE CORPUSCLES OF STANNIUS IN THE TOADFISH. J. Morphol. 155 (3): 271-286. Mar. 1978. SFA 23(3)
[Dep. Zool., Univ. Toronto, 25 Harbord St., Toronto, ON M5S 1A1, Canada]

78-001353 Brown, D. S. MEMBRANOUS PLATELETS: A DIFFUSION BARRIER IN THE TELEOST SWIMBLADDER. Ph.D. dissertation, Tulane Univ. 70p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(9):4005. Mar. 1978. SFA 23(3)

78-001354 Burton, D. MELANOPHORE DISTRIBUTION WITHIN THE INTEGUMENTARY TISSUES OF TWO TELEOST SPECIES, /PSEUDOPLEURONECTES AMERICANUS/ AND /GASTEROSTEUS ACULEATUS/ FORM /LEIURUS/. Can. J. Zool. 56 (4): 526-535. Apr. 1978. In English with French summ. SFA 23(3)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

78-001355 Caporiccio, B.; Connes, R. ETUDE ULTRASTRUCTURALE DES ENVELOPPES PERIOVOCYTAIRES ET PERIOVULAIRES DE /DICENTRARCHUS LABRAX/ L. (POISSON TELEOSTEEN). [ULTRASTRUCTURAL STUDY OF THE MEMBRANES ENVELOPING THE OVOCYTES AND THE OVA OF /DICENTRARCHUS LABRAX/ L. (TELEOSTEI).] Ann. Sci. Nat. Zool. Biol. Anim. 19 (4): 351-368. Oct.-Dec. 1977. In French with English summ. SFA 23(3)
[Lab. Biol. Anim., U.S.T.L. 34060 Montpellier Cedex, Stn. Biol. Mar. Lagunaire, F 34200 Sete, France]

78-001356 Coss, R. G.; Globus, A. SPINE STEMS ON TECTAL INTERNEURONS IN JEWEL FISH ARE SHORTENED BY SOCIAL STIMULATION. Science 200 (4343): 787-790. 19 May 1978. SFA 23(3)
[Dep. Psychol., Univ. Calif., Davis 95616]

78-001357 Devitsyna, G. V. COMPARATIVE MORPHOLOGY OF THE OLFACTORY ANALYZER IN FISH. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 116-125. 1977. SFA 23(3)
[Dep. Ichthyol., Moscow Univ., USSR] The structure of the olfactory receptor epithelium and the olfactory bulb is described in 6 species of sea and freshwater fish. The organizational features of the olfactory bulb correlate with the degree of development of the sensitivity of the organ. A number of species-specific traits, associated with the nature of water turbulence in the olfactory sac and with the ecological characteristics of the species are noted in

78-001357 CONTINUED
the olfactory receptor.

78-001358 Dowling, J. E.; Ehinger, B. THE INTERPLEXIFORM CELL SYSTEM. I. SYNAPSES OF THE DOPAMINERGIC NEURONS OF THE GOLDFISH RETINA. Proc. R. Soc. Lond. B Biol. Sci. 201 (1142): 13 Apr. 1978. SFA 23(3)
[Biol. Lab., Harvard Univ., Cambridge, MA 02138]

78-001359 Dubale, M. S.; Nair, C. N. OSTEOLOGY OF THE HEADS OF TWO SPECIES OF ROHTEE (FAMILY: CYPRINIDAE, /R. COTIO/ AND /R. ALFREDIANA/). J. Anim. Morphol. Physiol. 24 (2): 310-332. Dec. 1977. SFA 23(3)
[Dep. Zool., Univ. Sch. Sci., Gujarat Univ., Ahmedabad-380009, India]

78-001360 Dzhumaliyev, M. K. THE MORPHOLOGY AND TROPHIC CHARACTERISTICS OF THE SWIM BLADDER IN SOME ORDERS OF FISH. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 284-292. 1977. SFA 23(3)
[Kazakh Univ., Alma-Ata, USSR] The macro and micromorphology of the swim bladder of 22 species of bony fishes was studied. The micromorphology of the gas gland in fishes with a physoclistic air bladder and origin of the "rete mirabile" in physostomous fishes was examined.

78-001361 Fable, W. A., Jr.; Williams, T. D.; Arnold, C. R. DESCRIPTION OF REARED EGGS AND YOUNG LARVAE OF THE SPOTTED SEATROUT, /CYNOSCION NEBULOSUS/. NOAA Fish. Bull. 76 (1): 65-71. Jan. 1978. SFA 23(3)
[NMFS, Port Aransas, TX 78373] Adult spotted seatrout, /Cynoscion nebulosus/, were induced to spawn in the laboratory by controlling temperature and photoperiod. Development of eggs and larvae, reared at 25°C, is described to 15 days after hatching. The pelagic, spherical eggs have a mean diameter of 0.77 mm, and usually contain one oil globule averaging 0.22 mm in diameter. Hatching occurs about 18 h after fertilization. Standard length at hatching is between 1.30 and 1.56 mm. Spotted seatrout average 4.4 mm standard length at notochord flexion. The larvae, which were fed the rotifer, /Brachionis plicatilis/, and nauplii of /Artemia/ sp., grew to about 4.5 mm standard length in 15 days.

78-001362 Graham-Smith, W. ON SOME VARIATIONS IN THE LATERO-SENSORY LINES OF THE PLACODERM FISH /BOTHRIOLEPIS/. Philos. Trans. R. Soc. Lond. B Biol. Sci. 282 (986): 1-39. 3 Feb. 1978. SFA 23(3)
[Sandy Brae, Boars Hill, Oxford, England]

78-001363 Graham-Smith, W. ON THE LATERAL LINES AND DERMAL BONES IN THE PARIETAL REGION OF SOME CROSSOPTERYGIAN AND DIPNOAN FISHES. Philos. Trans. R. Soc. Lond. B Biol. Sci. 282 (986): 41-105. 3 Feb. 1978. SFA 23(3)
[Sandy Brae, Boars Hill, Oxford, England]

78-001364 Grant, C. J.; Spain, A. V. VARIATION IN THE BODY SHAPE OF THREE SPECIES OF AUSTRALIAN MULLETS (PISCES: MUGILIDAE) DURING THE COURSE OF DEVELOPMENT. Aust. J. Mar. Freshwater Res. 28 (6): 723-738. Dec. 1977. SFA 23(3)
[Dep. Zool., Univ. West Indes, Mona, Kingston 7, Jamaica]

78-001365 Gross, H. P. NATURAL SELECTION BY PREDATORS ON THE DEFENSIVE APPARATUS OF THE THREE-SPINED STICKLEBACK, /GASTEROSTEUS ACULEATUS/ L. Can. J. Zool. 56 (3): 398-413. Mar. 1978. In English with French summ. SFA 23(3)
[Dep. Biol., Queen's Univ., Kingston, ON K7L 3N6, Canada] Three-spined sticklebacks, (/Gasterosteus aculeatus/ L.) can receive considerable protection against predators from characteristic dorsal and pelvic spines. The size and structure of this defensive apparatus were examined in marine and freshwater populations located throughout the European distribution of this species and exposed to differing predatory species and levels of predation pressure. Marine populations appear to experience the greatest predation pressure and have the largest defensive apparatus. Predation in freshwater appears to decline towards both the northern and southern distributional extremes of /Gasterosteus/, a result attributable to the differential distributions of major piscine predators, especially pike and perch; and this pattern produces arched clines in the morphometrics of defensive structures. Local differences in central latitudes can also be attributed to site-specific differences in predation pressure. Evidence is given for both hereditary and environmental determination of variation in dorsal spine number.

78-001366 Gupta, R. K. COURSE OF CEPHALIC SENSORY CANALS IN /BAGARIUS BAGARIUS/ (HAM.). J. Anim. Morphol. Physiol. 24 (2): 333-338. Dec. 1977. SFA 23(3)
[Dep. Zool., Hindu Coll., Moradabad, (U.P.) India]

78-001367 Hughes, G. M.; Iwai, T. A MORPHOMETRIC STUDY OF THE GILLS IN SOME PACIFIC DEEP-SEA FISHES. J. Zool. (Lond.) 184 (2): 155-170. Feb. 1978. SFA 23(3)
[Res. Unit Comp. Anim. Respiration, Bristol Univ., England]

78-001368 Hulet, W. H. STRUCTURE AND FUNCTIONAL DEVELOPMENT OF THE EEL LEPTOCEPHALUS /ARIOSOMA BALEARICUM/ (DE LA ROCHE, 1809). Philos. Trans. R. Soc. Lond. B Biol. Sci. 282 (987): 107-138. 3 Feb. 1978. SFA 23(3)
[Mar. Biol. Inst., Univ. Texas Med. Br., Galveston 77550]

78-001369 Hunter, C. R.; Nayudu, P. L. SURFACE FOLDS IN SUPERFICIAL EPIDERMAL CELLS OF THREE SPECIES OF TELEOST FISH. J. Fish Biol. 12 (2): 163-166. Feb. 1978. SFA 23(3)
[Dep. Anat., Monash Univ., Clayton, Victoria 3168, Australia] Scanning electron microscope studies of fish epidermis demonstrate whorled arrangements of microfolds on the surface of superficial epidermal cells in the following species of teleost fish; the guppyfish /Poecilia reticulata/ (Peters), the goldfish /Carassius auratus auratus/ (L.), and the clown anemone fish /Amphiprion percula/ (Lacepede). The pattern is most pronounced in epidermal cells covering the scales, but is also seen in the epidermal cells of the tail and body fins. The whorled pattern was not present on the gill epithelium or the surface of the eyes. These observations differ from transmission electron microscope studies which have described the skin

78-001369 CONTINUED
as being composed of microvilli.

78-001370 Kazantseva-Selezneva, A. A. DIFFERENCE IN THE JAW-OPENING MECHANISM IN HIGHER AND LOWER ACTINOPTERYGIANS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 78-85. 1977. SFA 23(3)
[Paleontol. Inst., USSR Acad. Sci., Moscow, USSR] A study of the lower actinopterygians revealed a peculiarity in the structure of their pectoral girdle: 1) a relatively or totally rigid connection with the skull, 2) a motile clavicle and a distinctive visceral apparatus. On this basis the author concludes that the jaw-opening mechanism in Palaeonisci differs from that of the higher actinopterygians: manily it is the lower jaw that is abducted and the endocranium is immobile or almost immobile.

78-001371 Kirschbaum, F.; Meunier, F.; Tsuji, S. "NAKED" SPINAL CORD ON A NON-SEGMENTED BATON-LIKE BONY STRUCTURE IN THE TAIL OF THE ELECTRIC FISH /EIGENMANNIA VIRESCENS/ (GYMNOTOIDEI). Cell Tissue Res. 187 (2): 263-269. 24 Feb. 1978. SFA 23(3)
[S. Tsuji: Lab. Neurocytol., Univ. Paris, VI, 4 place Jussieu, 75005, Paris, France]

78-001372 Kryvi, H.; Totland, G. K. FIBRE TYPES IN LOCOMOTORY MUSCLES OF THE CARTILAGINOUS FISH /CHIMAERA MONSTROSA/. J. Fish Biol. 12 (3): 257-265. Mar. 1978. SFA 23(3)
[Inst. Anat., Univ. Bergen, Arstadveien 19, N-5000 Bergen, Norway] The cartilaginous fish /Chimaera monstrosa/ swims slowly by means of pectoral fin movements, and fast by undulations of the tail. In order to compare the fibres in the corresponding muscles, they were studied by histochemistry and electron microscopy. Three fibre types were identified by microphotometry and morphometry. Most of the axial muscles are white fibres, containing little mitochondria and glycogen. Red fibres, with glycogen and about 5 percent mitochondria constitute a thin sheet in the axial muscles, composed of one fibre layer only. Pink fibres, with intermediate amounts of glycogen and mitochondria are situated between these two types, but are often not covered by red fibres. Pectoral muscles contain numerous red and intermediate fibres, partially mixed, superficially, and white fibres deeper. Pectoral muscle red fibres contain about 25 percent mitochondria, half of which are situated in subsarcolemmal accummulations. The sarcotubular system has /T/-tubules at the /Z/ discs, and the terminal cisternae are partially divided by regularly spaced clefts.

78-001373 Kulshreshtha, S. D. HISTOMORPHOLOGY OF THE TASTE RECEPTORS OF SOME FRESHWATER FISHES. Indian J. Fish. 22 (1,2): 143-170. 1975. SFA 23(3)
[Dep. Zool., Goverment Coll., Kota, Rajasthan, India]

78-001374 Kurbatov, B. V.; Ovcharov, O. P. HYDRODYNAMIC FEATURES OF THE SEVRYUGA (/ACIPENSER STELLATUS/). J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.) 16 (6): 1039-1042. 1976. SFA 23(3)
[Ukranian Acad. Sci., Sevastopol, USSR]

78-001375 Laurent, P.; DeLaney, R. G.; Fishman, A. P. THE VASCULATURE OF THE GILLS IN THE AQUATIC AND AESTIVATING LUNGFISH (/PROTOPTERUS AETHIOPICUS/). J. Morphol. 156 (2): 173-208. May 1978. SFA 23(3)
[Lab. Physiol., CNRS, Strasbourg, France]

78-001376 Lesiuk, T. P.; Lindsey, C. C. MORPHOLOGICAL PECULIARITIES IN THE NECK-BENDING AMAZONIAN CHARACOID FISH /RHAPHIODON VULPINUS/. Can. J. Zool. 56 (4): 991-997. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

78-001377 Lopez, E.; Baud, C. A.; Boivin, G.; Lallier, F. ETUDE ULTRASTRUCTURALE, CHEZ UN POISSON TELEOSTEEN L'ANGUILLE (/ANGUILLA ANGUILLA/ L.), DES PROCESSUS DE MINERALISATION DANS LES CAS D'UNE OSSIFICATION PERICHONDRALE DE L'ARC BRANCHIAL ET D'UNE APPOSITION SECONDAIRE DANS L'OS VERTEBRAL. [ULTRASTRUCTURAL STUDY OF THE MINERALIZATION PROCESS DURING PERICHONDRAL OSSIFICATION OF THE GILL ARCH AND SECONDARY ACCRETION IN THE VERTEBRAL BONE OF THE EEL (/ANGUILLA ANGUILLA/ L.), A TELEOST FISH.] Ann. Biol. Anim. Biochim. Biophys. 18 (1): 105-117. 1978. In French with English summ. SFA 23(3)
[Mus. Natl. Hist. Nat., rue Cuvier 75005, Paris, France]

78-001378 Miyoshi, M. SCANNING ELECTRON MICROSCOPY OF THE RENAL CORPUSCLE OF THE MESONEPHROS IN THE LAMPREY, /ENTOSPHENUS JAPONICUS/ MARTENS. Cell Tissue Res. 187 (1): 105-113. 1978. SFA 23(3)
[Dep. Anat. Sch. Med., Fukuoka Univ., Fukuoka 814, Japan]

78-001379 Mosse, P. R. L. THE DISTRIBUTION OF CAPILLARIES IN THE SOMATIC MUSCULATURE OF TWO VERTEBRATE TYPES WITH PARTICULAR REFERENCE TO TELEOST FISH. Cell Tissue Res. 187 (2): 281-303. 24 Feb. 1978. SFA 23(3)
[Dep. Zool., Univ. Melbourne, Parkville, Victoria, Australia]

78-001380 Myagkov, N. A. [CHANGES IN BRAIN MORPHOLOGY OF /SQUALUS FERNANDINUS/ (SQUALIFORMES) DURING POSTEMBRYOGENESIS.] Zool. Zh. 57 (3): 407-412. Mar. 1978. In Russian with English summ. SFA 23(3)
[Tech. Inst. Fish Industry Fish., Kaliningrad, USSR]

78-001381 Myagkov, N. A.; Kondyurin, V. V. A MORPHOBIOLOGICAL DESCRIPTION OF THE DEEPWATER SPINY DOGFISH /ETMOPTERUS LUCIFER/ (SQUALIDAE) FROM WEST AFRICAN WATERS. J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.) 16 (6): 1014-1018. 1976. SFA 23(3)
[KTIRPiKh, Kaliningrad, USSR] The size of /E. lucifer/ ranges from 16.9 to 26.2 cm (on average 22.2 cm); the weight from 28 to 56 g (on average 42.4 g). /E. lucifer/ is an ovioviviparous shark with a conveyor type of development. Males reach maturity at a length of approximately 18.0 cm, females at 21.0 cm. Luminescent deepwater squids are a major part of the diet of /E. lucifer/; lanternfishes and shrimps are also found. /E. lucifer/ has been found at depths of more than 450 m in the West African region. Development of the various parts of the brain in /E. lucifer/ and other sharks of the family Squalidae is due mainly to the ecology of these species.--Concl.

78-001382 Nazarov, N. A. A MORPHOHISTOLOGICAL DESCRIPTION OF THE OVARIES OF THE HORSEMACKEREL (/TRACHURUS TRACHURUS/) FROM THE CELTIC SEA. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 417-423. 1977. SFA 23(3)
[AtlantNIRO, Kaliningrad, USSR] Data from morphohistological analysis of ovaries of horsemackerel (/Trachurus trachurus/) in a prespawning state are presented. Oocyte diameter at the end of trophoplasmic growth is shown to be related to the length and weight of the fish. A correlation is traced between the length, weight and age of the fish and absolute fecundity.

78-001383 Oguri, M. ON THE HEPATOSOMATIC INDEX OF HOLOCEPHALIAN FISH. Bull. Jpn. Soc. Sci. Fish. 44 (2): 131-134. Feb. 1978. SFA 23(3)
[Fish. Lab., Fac. Agric., Nagoya Univ., Nagoya 464, Japan]

78-001384 Paperna, I. SWIMBLADDER AND SKELETAL DEFORMATIONS IN HATCHERY BRED /SPARUS AURATA/. J. Fish Biol. 12 (2): 109-114. Feb. 1978. SFA 23(3)
[Heinz Steinitz Mar. Biol. Lab. Hebrew Univ. Jerusalem, Elat, Israel] Among hatchery bred /Sparus aurata/, 5.4 percent of the offspring of a single pair showed severe skeletal deformations coupled with marked growth retardation and pathological changes in the swimbladder. This resulted from extreme proliferation, then hypertrophy, of the cuboidal epithelial cells of the gas gland and proliferation of the rete mirabile. This caused almost complete congestion of the swimbladder air space. The nature of the pathological changes in the swimbladder and the possibility of hereditary origin for both the skeletal and swimbladder deformations are discussed.

78-001385 Pertseva-Ostroumova, T. A. ON THE DEVELOPMENT OF SOME SPECIES OF THE GENUS /GYMNOSCOPELUS/ (MYCTOPHIDAE). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 58-65. 1977. SFA 23(3)
[IOAN, Moscow, USSR] A description of the larvae of three species of the genus /Gymnoscopelus/ is given from specimens collected in the southern waters of the Atlantic, Indian and Pacific Oceans. The larvae differ in the number of rays in the unpaired fins, number of gill rakers on the 1st gill arch and nature of pigmentation. The data obtained make it possible to supplement and define more accurately the present concepts on the development of the species of this endemic genus of the Southern Hemisphere.

78-001386 Peters, H. M. ON THE MECHANISM OF AIR VENTILATON IN ANABANTOIDS (PISCES: TELEOSTEI/). Zoomorphologie 89 (2): 93-123. 1978. SFA 23(3)
[Lehrstuhl Zoophysiol., Abt. Verhaltensphysiol. Univ. Tubingen, Biem Kupferhammer 8, D-7400 Tubingen, West Germany]

78-001387 Pohla, H.; Lametschwandtner, A.; Adam, H. DIE VASKULARISATION DER KIEMEN VON /MYXINE GLUTINOSA/ L. (CYCLOSTOMATA). [THE VASCULARIZATION OF THE GILLS IN /MYXINE GLUTINOSA/ L. (CYCLOSTOMATA).] Zool. Scr. 6 (4): 331-341. 1977. In German with English summ. SFA 23(3)
[Zool. Inst., Univ. Salzburg, Salzburg, Austria]

78-001388 Rahmann, H.; Jeserich, G. QUANTITATIVE MORPHOGENETIC INVESTIGATIONS ON FINE STRUCTURAL CHANGES IN THE OPTIC TECTUM OF THE RAINBOW TROUT (/SALMO GAIRDNERI/) DURING ONTOGENESIS. Wilhelm Roux's Arch. Dev. Biol. 184 (1): 83-94. 1978. SFA 23(3)
[Inst. Zool., Univ. Stuttgart-Hohenheim, D-7000 Stuttgart 70, West Germany]

78-001389 Rawdon, B. B. ULTRASTRUCTURE OF THE NON-GRANULATED HYPOPHYSIAL CELLS IN THE TELEOST /PSEUDOCRENILABRUS PHILANDER/ (/HEMIHAPLOCHROMIS PHILANDER/), WITH PARTICULAR REFERENCE TO CYTOLOGICAL CHANGES IN CULTURE. Acta Zool. (Stockh.) 59 (1): 25-33. 1978. SFA 23(3)
[Dep. Anat., Univ. Witwatersrand, Johannesburg, South Africa]

78-001390 Rubtsov, V. V. CERTAIN CHARACTERISTICS OF MICROSTRUCTURE OF EGG MEMBRANES OF CARP /CYPRINUS CARPIO/. Sov. J. Dev. Biol. (Engl. Transl. Ontogenez) 8 (3): 261-264. Mar. 1978. SFA 23(3)
[Inst. Evol. Morphol. Anim. Ecol., Acad. Sci. USSR, Moscow, USSR]
With the help of the scanning electron microscope there were studied the characteristics of the microstructure of the egg membranes of carp and its changes during embryonic development. It is shown that the structure of the membranes suffers definite changes on formation of the perivitelline space, throughout embryogenesis, and prior to hatching of the embryos.

78-001391 Ruby, E. G.; Morin, J. G. SPECIFICITY OF SYMBIOSIS BETWEEN DEEP-SEA FISHES AND PSYCHROTROPHIC LUMINOUS BACTERIA. Deep-Sea Res. 25 (2): 161-167. Feb. 1978. SFA 23(3)
[Harvard Univ., Biol. Lab., 16 Divinity Ave., Cambridge, MA 02138]
Three hundred and twenty-five bacterial clones were isolated from the luminescent organs of 12 specimens of three species of the bathyal fish family Macrouridae (/Nezumia aequalis/, /N. stelgidolepis/, and /Sphagemacrurus hirundo/) from both the atlantic and Pacific oceans and four specimens of the midwater /Opisthoproctus grimaldii/. All of the isolates were the luminous psychrotrophic bacterium /Photobacterium phosphoreum/. This bacterium is the luminous species best suited to the cold temperatures of the deep-sea habitats where these fish families are encountered. On the other hand, previous studies have shown that luminous bacteria from luminescent organs of shallower water fishes of the temperate regions (Monocentridae) and tropics (Leiognathidae) contain the mesotrophic bacteria /P. fischeri/ and /P. leiognathi/, respectively. The differences in luminous bacterial symbionts, the distant phylogenetic relationships, and the marked differences in the structure and location of the luminescent organ among these four fish families suggest an independent and multiple origin of each of these bacteria-fish associations.

78-001392 Schoen, T. M. THE FINE STRUCTURE OF THE NOTOCHORD AND ADJACENT TISSUES OF AN EMBRYONIC TELEOST. M.S. thesis, Fla. Atl. Univ. 85p. 1977. From Masters Abstracts 16(1), Mar. 1978. SFA 23(3)
Paramyosin fibers were observed in newly born /Gambusia affinis/ larvae. Extraction procedures specific for paramyosin apparently removed the protein as evidence by electron microscopic examination. Recrystallization and polyacrylamide gel electrophoresis have identified the fibers as relatively homogenous paramyosin protein. The midstage embryo did not possess paramyosin fibers; however, the notochord and adjacent tissues were observed to be in a state of rapid protein synthesis. Mitochondrial association with nuclei and 'semi-rough' endoplasmic reticulum were seen. Mitochondria were shown to

78-001392 CONTINUED
possess lamellar bodies, which may be a form of degeneration. Lamellar body formation observed in other species of animals is discussed.

78-001393 Singh, S. P. FUNCTIONAL ANATOMY OF OLFACTORY ORGANS IN SOME MARINE TELEOSTS. Zool. Anz. 199 (5/6): 441-444. 1977. SFA 23(3)
[Dep. Zool., Magadh Univ., Bodh-Gaya, Bihar, India] The olfactory organs in /Strongylura strongylura/ and /Hemiramphus far/ show that the olfactory chamber is a simple open pit, from the centre of which protrudes a mushroom-shaped boss, representing the usual laminate rosette. The olfactory organs show secondary modifications which are related to their ecological habits.

78-001394 Sivak, J. G. THE FUNCTIONAL SIGNIFICANCE OF THE APHAKIC SPACE OF THE FISH EYE. Can. J. Zool. 56 (3): 513-516. Mar. 1978. In English with French summ. SFA 23(3)
[Lab. Comp. Optom., Univ. Waterloo, Waterloo, ON N2L 3G1, Canada] The localized aphakic (lensless) space of the fish eye has been credited with enlarging the binocular field of vision or enhancing the relative level of illumination of a portion of the retina. By relating pupil shape to the direction and magnitude of accommodative lens movement in fishes it may be shown that localized aphakic spaces exist as a means of facilitating lens movement.

78-001395 Ueck, M.; Ohnishi, R.; Wake, K. THE OUTER SEGMENTS OF PHOTORECEPTIVE PINEALOCYTES IN THE PINEAL ORGAN OF THE FUNA, /CARASSIUS GIBELIO LANGSDORFI/. A ACANNING ELECTRON MICROSCOPIC STUDY. Cell Tissue Res. 186 (2): 259-268. 1978. SFA 23(3)
[Zentrum Anat. Cytobiol., Auleveg 123, D-6300 Geissen-Lahn 1, West Germany]

78-001396 Verigina, I. A. STRUCTURE OF THE ALIMENTARY CANAL IN AMERICAN CATOSTOMIDS OF THE GENUS /ICTIOBUS/. 3. ALIMENTARY CANAL OF THE BLACK BUFFALO (/ICTIOBUS NIGER/). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 424-431. 1977. SFA 23(3)
[Zool. Mus., Moscow Univ., USSR]

78-001397 Yefremenko, V. N. MORPHOLOGICAL CHARACTERISTICS OF /PROTOMYCTOPHUM ANDERSSONI/ LARVAE (MYCTOPHIDAE). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (6): 958-963. 1976. SFA 23(3)
[VNIRO, Moscow, USSR]

78-001398 Zyznar, E. S.; Cross, F. B.; Nicol, J. A. C. URIC ACID IN THE TAPETUM LUCIDUM OF MOONEYES /HIODON/ (HIODONTIDAE TELEOSTEI). Proc. R. Soc. Lond. B Biol. Sci. 201 (1142): 1-6. 13 Apr. 1978. SFA 23(3)
[Dep. Biol., Bates Coll., Lewiston, ME 04240] Tapeta lucida (ocular reflectors) of mooneyes, /Hiodon tergisus/ and /H. alosoides/, lie in the pigment epithelium, the processes of which are packed with reflecting particles and also contain melanin granules. The reflecting particles are tiny birefringent crystals. On the basis of chromatography, u.v. spectroscopy and enzymic degradation (with uricase), it is concluded that the reflecting material contains uric acid. Mooneye tapeta are compared with those of other teleosts.

PHYSIOLOGY

78-001399 Abe, H.; Shimizu, C.; Matsuura, F. NAD(P) HYDROLYZING ENZYMES IN SKIPJACK LIVER--III. PURIFICATION AND PROPERTIES OF NUCLEOTIDE PYROPHOSPHATASE. Bull. Jpn. Soc. Sci. Fish. 44 (3): 279-284. Mar. 1978. SFA 23(3)
[Lab. Chem., Fac. Home Econ., Kyoritsu Women's Univ., Chiyoda-ku, Tokyo, Japan]

78-001400 Abe, H.; Shimizu, C.; Matsuura, F. NAD(P) HYDROLYZING ENZYMES IN SKIPJACK LIVER--IV. PURIFICATION AND PROPERTIES OF ALKALINE PHOSPHATASE. Bull. Jpn. Soc. Sci. Fish. 44 (3): 285-292. Mar. 1978. SFA 23(3)
[Lab. Chem., Fac. Home Econ., Kyoritsu Women's Univ., Chiyoda-ku, Tokyo, Japan]

78-001401 Abramowitz, J.; Chavin, W. COMPARISON OF TYROSINASE ACTIVITY IN THE INTEGUMENT OF XANTHIC AND ALBINO GOLDFISH, /CARASSIUS AURATUS/ L. Comp. Biochem. Physiol. B Comp. Biochem. 60 (1): 81-85. 1978. SFA 23(3)
[Dep. Biol., Wayne State Univ., Detroit, MI 48202]

78-001402 Atkinson, F.; Judd, F. W. COMPARATIVE HEMATOLOGY OF /LEPOMIS MICROLOPHUS/ AND /CICHLASOMA CYANOGUTTATUM/. Copeia 1978 (2): 230-237. 5 May 1978. SFA 23(3)
[Union Carbide Res. Farm, FM RD 2812, Edcough, TX 78538] Variation in the hematology of sympatric populations of the redear sunfish, /Lepomis microlophus/ (Centrarchidae), and the Rio Grande perch, /Cichlasoma cyanoguttatum/ (Cichlidae), from Hidalgo County, Texas, was studied from October 1974 to December 1975. There were no significant differences between the sexes in either species, but both species exhibited significant variation in blood parameters due to differences in standard length, reproductive condition or season. Change in reproductive condition apparently affected erythrocyte size. Seasonal changes in hemoglobin concentration and erythrocyte dimensions of /L. microlophus/ were consistent with a pattern of increasing values with increasing water temperature. Erythrocyte size in /C. cyanoguttatum/ may decrease with increasing water temperature. Hemoglobin concentration of the two species was similar, but /L. microlophus/ had a larger number of erythrocytes and less hemoglobin per erythrocyte than /C. cyanoguttatum/. Comparative data suggest that the magnitude of difference in the hematology of /L. microlophus/ and /C. cyanoguttatum/ is no greater than that which exists between species of /Lepomis/.

78-001403 Austreng, E. DIGESTIBILITY DETERMINATION IN FISH USING CHROMIC OXIDE MARKING AND ANALYSIS OF CONTENTS FROM DIFFERENT SEGMENTS OF THE GASTROINTESTINAL TRACT. Aquaculture 13 (3): 265-2729 Mar. 1978. SFA 23(3)
[Dep. Poultry Fur Anim. Sci., Agric. Univ. Norway, 1432 As-NLH, As, Norway] Methods of feed digestibility determination in fish were reviewed. The indicator method, using chromic oxide, was judged most suitable, but the best method of sampling faeces was uncertain. Rainbow trout (/Salmo gairdneri/, Richardson) were fed an experimental diet containing 1 percent chromic oxide. Faeces were collected by two stripping methods, and gut contents were obtained by dissection from five zones of the alimentary canal. Analyses of feed, faeces, and gut

78-001403 CONTINUED
contents were made, and digestibility of protein, fat, carbohydrate, ash and gross energy calculated. It was concluded that absorption occurs in all parts of the alimentary tract, and that it is important to limit the stripping of faeces for analysis in digestibility studies to the hindmost part of rectum, i.e. from the ventral fin to anus.

78-001404 Bailey, C. F. THE YOLK-PERIBLAST JUNCTION IN /FUNDULUS HETEROCLITUS/. Proc. Ark. Acad. Sci. 31: 19-20. 1977. SFA 23(3)
[Dep. Zool., Univ. Ark., Fayetteville 72701] The yolk of teleost eggs becomes covered with a syncytial periblast during embryonic development. Nutrients must be transported through the periblast before they are available to the embryo. Transmission electron micrographs of thin sections and of freeze-fractured replicas show a number of features at the yolk-periblast junction which may be correlated with yolk transport. These features include vesicle formation and exchange, channelization and interdigitation.

78-001405 Ballantyne, J. S.; George, J. C. THE EFFECTS OF LONG CHAIN FATTY ACIDS ON THE RESPIRATION OF LIVER MITOCHONDRIA OF COLD AND WARM ACCLIMATED RAT, PIGEON AND TROUT. J. Therm. Biol. 2 (4): 239-245. Dec. 1977. SFA 23(3)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

78-001406 Bartlett, G. R. PHOSPHATES IN RED CELLS OF TWO SOUTH AMERICAN OSTEOGLOSSIDS: /ARAPAIMA GIGAS/ AND /OSTEOGLOSSUM BICIRPHOSUM/. Can. J. Zool. 56 (4): 878-881. Apr. 1978. In English with French summ. SFA 23(3)
[Lab. Comp. Biochem., 4620 Santa Fe St., San Diego, CA 92109]

78-001407 Bartlett, G. R. PHOSPHATES IN RED CELLS OF TWO LUNGFISH: THE SOUTH AMERICAN, /LEPIDOSIREN PARADOXA/, AND THE AFRICAN, /PROTOPTERUS AETHIOPICUS/. Can. J. Zool. 56 (4): 882-886. Apr. 1978. In English with French summ. SFA 23(3)
[Lab. Comp. Biochem., 4620 Santa Fe St., San Diego, Ca 92109]

78-001408 Bartlett, G. R. WATER-SOLUBLE PHOSPHATES OF FISH RED CELLS. Can. J. Zool. 56 (4): 870-877. Apr. 1978. In English with French summ. SFA 23(3)
[Lab. Comp. Biochem., 4620 Santa Fe St., San Diego, Ca 92109]

78-001409 Bennemann, R. THE INFLUENCE OF ACCLIMATION AND EXPERIMENTAL TEMPERATURE ON GLUTAMATE DEHYDROGENASE OF CARP RED LATERAL MUSCLE (/CYPRINUS CARPIO/ L.). J. Therm. Biol. 2 (4): 209-214. Dec. 1977. SFA 23(3)
[Dep. Zool., Kiel, West Germany] The dependence of the reaction catalysed by carp red lateral muscle glutamate-dehydrogenase on acclimation and experimental temperature was studied. In addition to quantitative aspects of enzyme temperature compensation, the influence of temperature conditions on kinetic characteristics of the enzyme protein is reported. Results are discussed with respect to temperature capacity adaptation (acclimation).

78-001410 Bird, P. M. TISSUE REGENERATION IN THREE CARCHARNINID SHARKS ENCIRCLED BY EMBEDDED STRAPS. Copeia 1978 (2): 345-349. 5 May 1978. SFA 23(3)
[Mote Mar. Lab., 9501 Blind Pass Rd., Sarasota, FL 33581]

78-001411 Bonin, J. D.; Spotila, J. R. TEMPERATURE TOLERANCE OF LARVAL MUSKELLUNGE (/ESOX MASQUINONGY/ MITCHILL) AND F(1) HYBRIDS REARED UNDER HATCHERY CONDITIONS. Comp. Biochem. Physiol. A Comp. Physiol. 59 (3): 245-248. 1978. SFA 23(3)
[J. R. Spotila: Dep. Biol., State Univ. Coll. Buffalo, 1300 Elmwood Ave., Buffalo, NY 14222] Critical thermal maxima (CTM) of larval muskellunge (/Esox masquinongy/) and norlunge (/Esox masquinongy/ females x /E. lucius/ males) were determined under hatchery conditions. Norlunge had higher temperature tolerance and developed faster. CTM of larval norlunge (30.9-36.0°C, mean = 34.0°C) were significantly higher (/P/ ≤ 0.01) than those of muskellunge (29.9-35.6°C, mean = 32.8°C). Both fish exhibited a sharp decrease in CTM during swim-up, followed by a slow recovery period characterized by a general increase in CTM values. Both age and past thermal history had important effects on temperature tolerance of fry. Norlunge fry were better able to physiologically adjust to changing environmental conditions than were muskellunge.

78-001412 Booth, J. H. THE DISTRIBUTION OF BLOOD FLOW IN THE GILLS OF FISH: APPLICATION OF A NEW TECHNIQUE TO RAINBOW TROUT (/SALMO GAIRDNERI/). J. Exp. Biol. 73: 119-129. Apr. 1978. SFA 23(3)
[Dep. Zool., Univ. Toronto, Toronto, ON M5S 1A1, Canada] Injecting vitally stained blood cells into the ventral aorta of unrestrained cannulated fish, and rapid freezing in liquid nitrogen, provided a method of investigating blood flow patterns in the gills. Rainbow trout in air-saturated water perfused an average of 58 percent of the secondary lamellae of the gills. Perfusion of the filamental central compartment was insignificant indicating that the effects of any non-respiratory shunting would be unimportant. If the functional surface area of the gills is variable, it seems likely that this would be accomplished through lamellar recruitment. There was no evidence that pillar cell contraction affected lamellar perfusion. There was preferential perfusion of lamellae near the base of the filaments, and of filaments near the dorsal end of the gill arches.

78-001413 Brett, J. R.; Blackburn, J. M. METABOLIC RATE AND ENERGY EXPENDITURE OF THE SPINY DOGFISH, /SQUALUS ACANTHIAS/. J. Fish. Res. Board Can. 35 (6): 816-821. June 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

78-001414 Bullock, A. M.; Marks, R.; Roberts, R. J. THE CELL KINETICS OF TELEOST FISH EPIDERMIS: MITOTIC ACTIVITY OF THE NORMAL EPIDERMIS AT VARYING TEMPERATURES IN PLAICE (/PLEURONECTES PLATESSA/). J. Zool. (Lond.) 184 (3): 423-428. Mar. 1978. SFA 23(3)
[Dunstaffnage Mar. Res. Lab., Oban, Argyll, Scotland]

78-001415 Bulow, F. J.; Coburn, C. B.; Wolters, W. R. USE OF LIVER WEIGHT AS AN INDEX TO FISH CONDITION. J. Tenn. Acad. Sci. 53 (2): 75. Apr. 1978. Abstract only. SFA 23(3)
[Tenn. Tech. Univ., Cookeville] Bluegills were held at 25 C in separate aquaria for two weeks and fed mealworms at 0, 2.44, and 4.00 percent of their total body weight per day. Relative growth rate, liver RNA/DNA, muscle RNA/DNA, and liver-body weight ratio increased with food ration level, indicating the liver weight as a possible easily measured indicator of fish condition or growth status. Monthly liver-body weight ratios of bluegills from Center Hill Reservoir and Cookeville City Lake showed negative correlations with temperature, with ratios being lowest during the summer. Liver-body weight ratios of Cookeville City Lake bluegills were consistently higher than those of Center Hill Reservoir bluegills throughout the year. Interpretations of these results are discussed.

78-001416 Cairns, M. A.; Christian, A. R. EFFECTS OF HEMORRHEGIC STRESS ON SEVERAL BLOOD PARAMETERS IN ADULT RAINBOW TROUT (/SALMO GAIRDNERI/). Trans. Am. Fish. Soc. 107(2): 334-340. Mar. 1978. SFA 23(3)
[U.S. EPA, Corvallis Environ. Res. Lab., Corvallis, OR 97330]

78-001417 Cameron, J. N.; Wood, C. M. RENAL FUNCTION AND ACID-BASE REGULATION IN TWO AMAZONIAN ERYTHRINID FISHES: /HOPLIAS MALABARICUS/, A WATER BREATHER, AND /HOPLERYTHRINUS UNITAENIATUS/, A FACULTATIVE AIR BREATHER. Can. J. Zool. 56 (4): 917-930. Apr. 1978. In English with French summ. SFA 23(3)
[Univ. Tex., Mar. Sci. Lab., Port Aransas 78373]

78-001418 Chekunova, V. I.; Naumov, A. G. ENERGY METABOLISM OF THE FALKLAND SPRAT, /SPRATTUS FUEGENSIS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 299-304. 1977. SFA 23(3)
[VNIRO, Moscow, USSR] On the basis of respiratory experiments carried out on board ship, a connection has been established between metabolism and weight in the Falkland sprat, /Sprattus fuegensis/, at 10°, which is described by the equation $R = 0.315W^{1}$. Energy expenditure on metabolism constitutes 3.7 percent body weight, expenditure on increment changes with age (from 1.3 percent in yearlings to 0.4 percent in 4-year-old fish). The mean daily ration of the sprat constitutes 6-8 percent of body weight. Large Euphausiacea are the main component of its food during a period of intensive feeding (December-January).

78-001419 Chulitskaya, E. V.; Fel'gengauer, P. E. NONCYTOSTATIC EFFECT OF CYTOPLASM FROM OOCYTES AND MATURE EGGS OF THE GRASS FROG AND STURGEON. Sov. J. Dev. Biol. (Engl. Transl. Ontogenez) 8 (3): 258-261. Mar. 1978. SFA 23(3)
[Inst. Dev. Biol., Acad. Sci. USSR, Moscow, USSR] The study involved a search, in the cytoplasm of oocytes and mature, inactivated eggs of the grass frog /Rana temporaria/ and the sturgeon /Acipenser stellatus/, for the cytostatic factor discovered by Masui and Markert in oocyte and egg cytoplasm of /Rana pipiens/. Cytoplasm was injected into embryos of the same species at various stages of the first cleavage division in the animal region of one of the two blastomeres. Injection of cytoplasm did not cause arrest of cleavage divisions. Many embryos gastrulated normally. Thus, cytoplasm from maturing oocytes and mature eggs in the grass frog and sturgeon does not possess cytostatic activity--unlike the cytoplasm of /Rana pipiens/ oocytes and eggs.

78-001420 Cothron, P. D.; Coburn, C. B., Jr. A COMPARATIVE IN VITRO STUDY OF THE EFFECTS OF VARIOUS BALANCED SALINE SOLUTIONS ON RESPIRATION RATES OF LIVER TISSUES OF THREE FISH SPECIES. J. Tenn. Acad. Sci. 53 (2): 74. Apr. 1978. Abstract only. SFA 23(3)
[Tenn. Tech. Univ., Cookeville] A balanced saline solution for fish tissues was needed for use in a manometric experiment dealing with oxygen uptake by fish liver. Since little information dealing with balanced saline solutions for fish tissues was available in the literature, this research was begun in order to obtain an indication of whether a significant difference is produced among fish livers respiring in varied fish and mammalian solutions. Using literature values, several balanced saline solutions were postulated and were compared to Krebs-Ringer Phosphate. Results of this research indicated that differences in the basic fish and mammalian salines tested did not significantly affect cellular respiration in fish liver mince. In liver tissues which contained sufficient oxidizable substrate, presence or absence of glucose and differences in ionic constituents of the fish and mammalian solutions tested had no effect on cellular respiration in liver tissue mince during a 45 minute period. In cells apparently lacking sufficient oxidizable substrate, glucose-containing media produced results significantly different from those yielded by non-glucose-containing media. Effects of pH and of temperature were observed.

78-001421 Craik, J. C. A. PLASMA LEVELS OF VITELLOGENIN IN THE ELASMOBRANCH /SCYLIORHINUS CANICULA/ L. (LESSER SPOTTED DOGFISH). Comp. Biochem. Physiol. B Comp. Biochem. 60 (1): 9-18. 1978. SFA 23(3)
[Dep. Oceanogr., The University, Southampton, England]

78-001422 Daikoku, T. CHANGES AND EFFECTS OF TRIMETHYLAMINE OXIDE IN FRESHWATER FISHES, THE GUPPIES, /POECILIA RETICULATA/ AND THE GOLDFISH, /CARASSIUS AURATUS/. Annot. Zool. Jpn. 50 (4): 203-211. Dec. 1977. SFA 23(3)
[Dep. Biol., Sci. Educ. Inst. Osaka Pref., Osaka 558, Japan]

78-001423 Dalmaz, Y.; Peyrin, L. OCCURRENCE OF DOPAMINE IN THE CHROMAFFIN TISSUE OF A CARTILAGINOUS SELACHIAN FISH: /SCYLIORHINUS CANICULA/. Comp. Biochem. Physiol. C Comp. Pharmacol. 59 (2): 135-143. 1978. SFA 23(3)
[Dep. Physiol., UER Grange Blanche, 8 Ave. Rockefeller, 69008 Lyon, France]

78-001424 Datta Munshi, J. S.; Pandey, B. N.; Pandey, P. K.; Ojha, J. OXYGEN UPTAKE THROUGH GILLS AND SKIN IN RELATION TO BODY WEIGHT OF AN AIR-BREATHING SILUROID FISH, /SACCOBRANCHUS (=HETEROPNEUSTES) FOSSILIS/. J. Zool. (Lond.) 184 (2): 171-180. Feb. 1978. SFA 23(3)
[Post-Grad. Dep. Zool., Bhagalpur Univ., Bhagalpur-812007, Bihar, India]

78-001425 Devitsina, G. V.; Malyukina, G. A. THE FUNCTIONAL ORGANIZATION OF THE OLFACTORY ORGAN IN MACROSMATIC AND MICROSMATIC FISHES. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 432-440. 1977. SFA 23(3)

[Dep. Ichthyol., Moscow Univ., USSR] The functional characteristics of olfaction were investigated by recording the total electrical activity from the secondary olfactory tracts in fishes differing in the level of development of the olfactory apparatus. It was demonstrated that the olfactory organ is a slowly adapting system in all fish species. The nature of the response to an odor is not dependent on the type of stimulus employed, but is determined by the species of fish and by its functional state, whereas the intensity of the response is dependent on the type and amount of the stimulus. Increased sensitivity to natural odorants has been found in all species. Macrosmatic and microsmatic fishes differ in the spectra of the stimuli perceived, in the nature of the background and induced activity, in their attitude to the mechanical component of the stimulus, in their rate of adaptation and fatigue. It has been found that the olfactory organ of macrosmatic fishes is sensitized under the influence of small doses of natural stimuli.

78-001426 Downs, R. A. CHROMATIN AND HISTONES IN THE ZEBRA FISH, /BRACHYDANIO RERIO/: TEMPLATE AVAILABILITY, HISTONES AND RNA SYNTHESIS DURING EARLY DEVELOPMENT. Ph.D. dissertation, State Univ. N.Y. (Buffalo) 105p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(3):1004. Sept. 1977. SFA 23(3)

78-001427 Driedzic, W. R.; Phleger, C. F.; Fields, J. H. A.; French, C. ALTERATIONS IN ENERGY METABOLISM ASSOCIATED WITH THE TRANSITION FROM WATER TO AIR BREATHING IN FISH. Can. J. Zool. 56 (4): 730-735. Apr. 1978. In English with French summ. SFA 23(3)

[Biol. Dep., Mount Allison Univ., Sackville, NB E0A 3C0, Canada]

78-001428 Durve, V. S.; sharma, M. S. OXYGEN REQUIREMENT OF THE EARLY STAGES OF THE MAJOR CARP /LABEO CALBASU/. J. Anim. Morphol. Physiol. 24 (2): 391-393. Dec. 1977. SFA 23(3)

[Dep Zool., Univ. Udaipur, Udaipur-313 001, India]

78-001429 Dzhabarov, M. I. AN ELECTROPHORETIC STUDY OF THE BLOOD SERUM PROTEINS OF /CHALCALBURNUS CHALCOIDES/ AND /LUCIOPERCA LUCIOPERCA/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (6): 988-995. 1976. SFA 23(3)

[Inst. Zool., Azerbaydzhanian Acad. Sci., Baku, USSR] The protein composition of the blood serum of the "shemaya", /Chalcalburnus chalcoides/, and of the walleye, /Lucioperca lucioperca/, from the area of the Caspian Sea around the Kura River has been investigated by electrophoresis in agar gel. The blood serum proteins of these species are divisible into 6-7 principal fractions. The relative quantity of the individual protein fractions varies during different periods in the annual cycle; considerable variation is to be observed in the spawning period. Certain general features are established in the seasonal dynamics of the content of individual protein fractions in the blood serum of the "shemaya" and the walleye.

78-001430 Eckstein, B.; Abraham, M.; Zohar, Y. PRODUCTION OF STEROID HORMONES BY MALE AND FEMALE GONADS OF /SPARUS AURATA/ (TELEOSTEI, SPARIDAE). Comp. Biochem. Physiol. B Comp. Biochem. 60 (1): 93-97. 1978. SFA 23(3)
[Dep. Zool., Hebrew Univ. Jerusalem, Israel]

78-001431 Farrell, A. P. CARDIOVASCULAR EVENTS ASSOCIATED WITH AIR BREATHING IN TWO TELEOSTS, /HOPLERYTHRINUS UNITAENIATUS/ AND /ARAPAIMA GIGAS/. Can. J. Zool. 56 (4): 953-958. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-001432 Fedorov, K. Ye.; Smirnova, Zh. V. PARTIAL PURIFICATION OF PINK SALMON (/ONCORHYNCHUS GORBUSCHA/) GONADOTROPIN. J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.) 16 (6): 1024-1027. 1976. SFA 23(3)
[Biol. Res. Inst., Univ. Leningrad, USSR]

78-001433 Fedorov, K. Ye. REACTION OF STIMULATION OF OOCYTE MATURATION OUTSIDE THE BODY OF THE FEMALE RUFFE, /ACERINA CERNUA/, AS A WAY OF TESTING FISH GONADOTROPINS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 277-283. 1977. SFA 23(3)
[Lab. Exp. Ichthyol., Biol. Res. Inst., Leningrad Univ., USSR]
After preliminary sensitization of overwintering female ruffe, /Acerina cernua/, by means of pituitary injections, the oocytes of the older generation acquire the ability to complete preparation for maturation under in vitro conditions in the presence of gonadotropic hormones. On this basis it is intended to use the hormone-dependent reaction of oocyte polarization of fishes as a zoologically specific, sensitive and, from the methodological point of view reliable test of fish gonadotropins.

78-001434 Fields, J. H. A.; Driedzic, W. R.; French, C. J.; Hochachka, P. W. KINETIC PROPERTIES OF GLUTAMATE DEHYDROGENASE FROM THE GILLS OF /ARAPAIMA GIGAS/ AND /OSTEOGLOSSUM BICIRRHOSUM/. Can. J. Zool. 56 (4): 809-813. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. Wash., NJ-15, Seattle, WA 98195]

78-001435 Fields, J. H. A.; Driedzic, W. R.; French, C. J.; Hochachka, P. W. SOME KINETIC PROPERTIES OF SKELETAL MUSCLE PYRUVATE KINASE FROM AIR-BREATHING AND WATER-BREATHING FISH OF THE AMAZON. Can. J. Zool. 56 (4): 751-758. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. Wash., Seattle 98195]

78-001436 Fishman, R. B. STUDIES OF OPTOKINETIC BEHAVIOR AND RELATED OCULOMOTOR STRUCTURES IN THE EMBRYONIC AND ADULT GOBIID FISH, /BATHYGOBIUS SOPORATOR/. Ph.D. dissertation, City Univ. New York 230p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8):3510. Feb. 1978. SFA 23(3)

78-001437 Fletcher, C. R. OSMOTIC AND IONIC REGULATION IN THE COD (/GADUS CALLARIAS/ L.). II. SALT BALANCE. J. Comp. Physiol. B Biochem. Syst. Environ. Physiol. 124 (2): 157-168. 1978. SFA 23(3)
[Dep. Pure Appl. Zool., Univ. Leeds, Leeds LS2 9JT, England]

78-001438 Fletcher, C. R. OSMOTIC AND IONIC REGULATION IN THE COD (/GADUS CALLARIAS/ L.). I. WATER BALANCE. J. Comp. Physiol. B Biochem. Syst. Environ. Physiol. 124 (2): 149-155. 1978. SFA 23(3)
[Dep. Pure Appl. Zool., Univ. Leeds, Leeds LS2 9JT, England]

78-001439 Fletcher, G. L.; King, M. J. SEASONAL DYNAMICS OF CU^2, ZN^2, CA^2, AND MG^2 IN GONADS AND LIVER OF WINTER FLOUNDER (/PSEUDOPLEURONECTES AMERICANUS/): EVIDENCE FOR SUMMER STORAGE OF ZN^2 FOR WINTER GONAD DEVELOPMENT IN FEMALES. Can. J. Zool. 56 (2): 284-290. Feb. 1978. In English with French summ. SFA 23(3)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

78-001440 Follenius, F.; Dubois, M. P. IMMUNOCYTOLOGICAL DETECTION AND LOCALIZATION OF A PEPTIDE REACTING WITH AN ALPHA-ENDORPHIN ANTISERUM IN THE CORTICOTROPIC AND MELANOTROPIC CELLS OF THE TROUT PITUITARY (/SALMO IRIDEUS/ GIBB). Cell Tissue Res. 188 (2): 273-283. 17 Apr. 1978. SFA 23(3)
[Lab. Cytol. Anim., 12 rue de l'universite, 67000 Strasbourg, France]

78-001441 Forster, R. P.; Hannafin, J. A.; Goldstein, L. OSMOREGULATORY ROLE OF AMINO ACIDS IN BRAIN OF THE ELASMOBRANCH, /RAJA ERINACEA/. Comp. Biochem. Physiol. A Comp. Physiol. 60 (1): 25-30. 1978. SFA 23(3)
[Dep. Biol. Sci., Dartmouth Coll., Hanover, NH 03755]

78-001442 Foucher, R. P.; Beamish, R. J. A REVIEW OF OOCYTE DEVELOPMENT IN FISHES WITH SPECIAL REFERENCE TO PACIFIC HAKE (/MERLUCCIUS PRODUCTUS/). Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 755. iv + 16p. Dec. 1977. In English with French summ. SFA 23(3)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Much of the literature relating to reproductive development of female fishes was reviewed to examine the methods of oocyte development. There appeared to be considerable confusion concerning the possible mechanisms of formation of each year's supply of oocytes. Three theories could be separated from the literature: (1) the annual division of oogonia by mitosis to increase the numbers of potential oocytes (still diploid); (2) transformation of follicle cells within the ovigerous lamellae into oocytes; (3) the full complement of oocytes is present at maturity. The literature contains few references to meiosis which is necessary for the production of haploid gametes. Meiosis appears to begin early in oocyte development and then is halted while the oocyte goes through its major growth phases. The later maturation stages occur when the oocyte is almost fully grown and ready for ovulation. Of specific interest was the oocyte development in true hakes (/Merluccius/ sp.) and especially the Pacific hake, /M. productus/. Fish in this genus, because of their commercial importance around the world, have been studied extensively. Some true hakes, it has been found, are capable of multiple spawnings in a season. The relatively poorly studied Pacific hake, however, seems capable of only a single spawning in a year and has a great variation in the number of advanced

78-001442 CONTINUED
oocytes produced. This raises the question of possible environmental influences on fecundity. A subsequent paper will report the results of a study based on the present review attempting to explain the origin and fate of the small yolked oocytes remaining after spawning, the source of each year's supply of oocytes and relations to environmental factors and recruitment.

78-001443 French, C. J.; Hochachka, P. W. LACTATE DEHYDROGENASE ISOZYMES FROM HEART AND WHITE MUSCLE OF WATER-BREATHING AND AIR-BREATHING FISH FROM THE AMAZON. Can. J. Zool. 56 (4): 769-773. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-001444 Gardiner, D. M. UTILIZATION OF EXTRACELLULAR GLUCOSE BY SPERMATOZOA OF TWO VIVIPAROUS FISHES. Comp. Biochem. Physiol. A Comp. Physiol. 59 (2): 165-168. 1978. SFA 23(3)
[Dep. Biol., Occidental Coll., Los Angeles, CA 90041]

78-001445 Gewirtz, D. A. STUDIES ON THE INTERMEDIARY COMPLEXES OF SODIUM-POTASSIUM DEPENDENT ADENOSINETRIPHOSPHATASE FROM EEL ELECTRIC ORGAN. Ph.D. dissertation, City Univ. N.Y. 146p. 1978. From Diss. Abstr. Int. B Sci. Eng. 38(9):4088. Mar. 1978. SFA 23(3)

78-001446 Goetz, F. W.; Bergman, H. L. THE EFFECTS OF STEROIDS ON FINAL MATURATION AND OVULATION OF OOCYTES FROM BROOK TROUT (/SALVELINUS FONTINALIS/) AND YELLOW PERCH (/PERCA FLAVESCENS/). Biol. Reprod. 18 (2): 293-298. Mar. 1978. SFA 23(3)
[Dep. Biol., Univ. Notre Dame, Notre Dame, IN 46566]

78-001447 Goetz, F. W.; Bergman, H. L. THE IN VITRO EFFECTS OF MAMMALIAN AND PISCINE GONADOTROPIN AND PITUITARY PREPARATIONS ON FINAL MATURATION IN YELLOW PERCH (/PERCA FLAVESCENS/) AND WALLEYE (/STIZOSTEDION VITREUM/). Can. J. Zool. 56 (2): 348-350. Feb. 1978. In English with French summ. SFA 23(3)
[Dep. Biol., Univ. Notre Dame, Notre Dame, IN 46556] The in vitro effects of various gonadotropin and pituitary preparations on germinal vesicle breakdown (GVBD) were investigated in yellow perch (/Perca flavescens/) and walleye (/Stizostedion vitreum/). All preparations tested were effective in walleye; however, none of the preparations induced significant GVBD in yellow perch.

78-001448 Goudie, C. A.; Davis, K. B. RELATIONSHIP OF CALCIUM AND SALINITY ON ELECTROLYTE METABOLISM IN CHANNEL CATFISH. J. Tenn. Acad. Sci. 53 (2): 74. Apr. 1978. Abstract only. SFA 23(3)
[Memphis State Univ., Memphis, TN] Addition of calcium to water has been implicated in reducing electrolyte imbalance which often accompanies various types of stress in fish. Tissue sodium and chloride levels and intra- extracellular water distribution was compared in channel catfish acclimated to 0, 7.5, and 11 g/liter CaSO(4) tap water and in calcium enriched (1.07 g/liter Ca SO 4) tap water at 10°C. In fish from 7.2 g/liter sodium chloride low in calcium, slight elevations in plasma sodium and chloride, chloride space, and muscle sodium occurred, but muscle water decreased when compared to those in 0 g/liter. These effects were more dramatic in fish held in 11 g/liter sodium chloride. Fish held in calcium enriched tap water at 0 and 7.5 g/liter sodium chloride revealed no apparent differences in these parameters. Elevations in 11 g/liter sodium

78-001448 CONTINUED
chloride in calcium enriched water were not as dramatic when campared to 11 g/liter sodium chloride in aged tap water. These data suggest that the presence of calcium diminishes the effects of high salinity at this temperature. Environmental calcium may aid electrolyte regulation and water distribution in fresh water fish in elevated salinities.

78-001449 Griffith, J. S. EFFECTS OF LOW TEMPERATURE ON THE SURVIVAL AND BEHAVIOR OF THREADFIN SHAD, /DOROSOMA PETENENSE/. Trans. Am. Fish. Soc. 107 (1): 63-70. Jan. 1978. SFA 23(3)
[Dep. Biol., Idaho State Univ., Pocatello 83209]

78-001450 Guderley, H.; Fields, J. H. A.; Cardenas, J. M.; Hochachka, P. W. PYRUVATE KINASE FROM THE LIVER AND KIDNEY OF /ARAPAIMA GIGAS/. Can. J. Zool. 56 (4): 852-859. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Biochem. Biophys., Oreg. State Univ., Corvallis]

78-001451 Gulidov, M. V.; Popova, K. S. THE INFLUENCE OF INCREASED O(2) CONCENTRATIONS ON THE SURVIVAL AND HATCHING OF THE EMBRYOS OF THE BREAM, /ABRAMIS BRAMA/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 174-177. 1977. SFA 23(3)
IEMEZh, Moscow, USSR]

78-001452 Hamid, A.; Sakata, T.; Kakimoto, D. MICROFLORA IN THE ALIMENTARY TRACT OF GRAY MULLET--II. A COMPARISON OF THE MULLET INTESTINAL MICROFLORA IN FRESH AND SEA WATER. Bull. Jpn. Soc. Sci. Fish. 44 (1): 53-57. Jan. 1978. SFA 23(3)
[Lab. Microbiol., Fac. Fish., Kagoshima Univ., Kagoshima, Japan]

78-001453 Hara, A.; Hirai, H. COMPARATIVE STUDIES ON IMMUNOCHEMICAL PROPERTIES OF FEMALE-SPECIFIC SERUM PROTEIN AND EGG YOLK PROTEINS IN RAINBOW TROUT (/SALMO GAIRDNERI/). Comp. Biochem. Physiol. B Comp. Biochem. 59 (4): 339-343. 1978. SFA 23(3)
[Dep. Biochem., Hokkaido Univ. Sch. Med., Sapporo, Hokkaido, Japan]

78-001454 Hardig, J. MATURATION OF CIRCULATING RED BLOOD CELLS IN YOUNG BALTIC SALMON (/SALMO SALAR/ L.). Acta Physiol. Scand. 102 (3): 290-300. Mar. 1978. SFA 23(3)
[Dep. Zoophysiol., Univ. Uppsala, Sweden]

78-001455 Hasnain, A. U.; Kimura, I.; Arai, K.-I.; Yasui, T. COMPARATIVE STUDIES ON THE TRYPTIC DIGESTION OF ACTOMYOSINS AND MYOSINS FROM SEVERAL FISH SPECIES--II. CHANGES IN CA^2 AND EDTA-ATPASES. Bull. Jpn. Soc. Sci. Fish. 44 (2): 143-147. Feb. 1978. SFA 23(3)
[Lab. Meat Dairy Sci., Fac. Agric., Hokkaido Univ., Sapporo, Japan]

78-001456 Hata, M.; Hata, M. CAROTENOID METABOLISM IN FANCY RED CARP, /CYPRINUS CARPIO/--III. ACCUMULATION OF LUTEIN IN THE INTEGUMENT. Bull. Jpn. Soc. Sci. Fish. 44 (1): 83-84. Jan. 1978. SFA 23(3)
[Dep. Fish., Fac. Agric., Tohoku Univ., Sendai, Japan]

78-001457 Hayashi, K.; Takagi, T. LIPID METABOLISM IN FISH. II. CHANGES OF LIPIDS AND FATTY ACIDS IN THE LIVER OF PUFFER, /FUGU VERMICULARE PORPHYREUM/, DURING STARVATION. Bull. Fac. Fish. Hokkaido Univ. 28 (4): 193-201. Nov. 1977. SFA 23(3)
[Lab. Chem. Fish Oil, Fac. Fish., Hokkaido Univ., Japan]

78-001458 Hedden, W. L., Jr.; Dowling, J. E. THE INTERPLEXIFORM CELL SYSTEM. II. EFFECTS OF DOPAMINE ON GOLDFISH RETINAL NEURONES. Proc. R. Soc. Lond. B Biol. Sci. 201 (1142): 27-55. 13 Apr. 1978. SFA 23(3)
[Biol. Lab., Harvard Univ., Cambridge, MA 02138]

78-001459 Hirshfield, M. F. THE REPRODUCTIVE ECOLOGY AND ENERGETICS OF THE JAPANESE MEDAKA, /ORYZIAS LATIPES/. Ph.D. dissertation, Univ. Mich. 185p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(3):1032. Sept. 1977.

78-001460 Hochachka, P. W.; Hulbert, W. C. GLYCOGEN 'SEAS, 'GLYCOGEN BODIES, AND GLYCOGEN GRANULES IN HEART AND SKELETAL MUSCLE OF TWO AIR-BREATHING, BURROWING FISHES. Can. J. Zool. 56 (4): 774-786. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-001461 Hochachka, P. W.; Guppy, M.; Guderley, H. E.; Storey, K. B.; Hulbert, W. C. METABOLIC BIOCHEMISTRY OF WATER- VS. AIR-BREATHING FISHES: MUSCLE ENZYMES AND ULTRASTRUCTURE. Can. J. Zool. 56 (4): 736-750. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-001462 Hochachka, P. W.; Guppy, M.; Guderley, H.; Storey, K. B.; Hulbert, W. C. METABOLIC BIOCHEMISTRY OF WATER- VS. AIR-BREATHING OSTEOGLOSSIDS: HEART ENZYMES AND ULTRASTRUCTURE. Can. J. Zool. 56 (4): 759-768. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-001463 Hochachka, P. W.; Moon, T. W.; Bailey, J.; Hulbert, W. C. THE OSTEOGLOSSID KIDNEY: CORRELATIONS OF STRUCTURE, FUNCTION, AND METABOLISM WITH TRANSITION TO AIR BREATHING. Can. J. Zool. 56 (4): 820-832. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-001464 Holeton, G. F.; Stevens, E. D. SWIMMING ENERGETICS OF AN AMAZONIAN CHARACIN IN 'BLACK' AND 'WHITE' WATER. Can. J. Zool. 56 (4): 983-987. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. Toronto, Toronto, ON, Canada]

78-001465 Holmgren, S. SYMPATHETIC INNERVATION OF THE COELIAC ARTERY FROM A TELEOST, /GADUS MORHUA/. Comp. Biochem. Physiol. C Comp. Pharmacol. 60 (1): 27-32. 1978. SFA 23(3)
[Dep. Zoophysiol., Univ. Goteborg, Goteborg, Sweden]

78-001466 Honn, K. V. /IN VIVO/ AND /IN VITRO/ ENDOCRINE AND PARAENDOCRINE RESPONSES OF ELASMOBRANCHS TO ALTERED ENVIRONMENTAL TEMPERATURE. Ph.D. dissertation, Wayne State Univ. 621p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(5):2061. Nov. 1977. SFA 23(3)

78-001467 Horseman, N. D.; Meier, A. H. PROSTAGLANDIN AND THE OSMOREGULATORY ROLE OF PROLACTIN IN A TELEOST. Life Sci. 22 (17): 1485-1490. 1 May 1978. SFA 23(3)
[Dep. Zool. Physiol., La. State Univ., Baton Rouge 70803] Prolactin stimulates elevation of plasma chloride concentrations in /Fundulus grandis/. Treatment of fish with inhibitors of prostaglandin synthesis (indomethacin or asprin) prevents elevation of plasma chloride following prolactin injection. Prostaglandin E(1) stimulates increased plasma chloride concentrations in either indomethacin- or aspirin-treated fish. We theorize from these results that at least some of prolactin's actions with regard to teleostean osmoregulation are mediated by stimulation of prostaglandin synthesis.

78-001468 Houston, A. H.; McCarty, L. S. CARBONIC ANHYDRASE (ACETAZOLAMIDE-SENSITIVE ESTERASE) ACTIVITY IN THE BLOOD, GILL AND KIDNEY OF THE THERMALLY ACCLIMATED RAINBOW TROUT, /SALMO GAIRDNERI/. J. Exp. Biol. 73: 15-27. Apr. 1978. SFA 23(3)
[Dep. Biol. Sci., Brock Univ., St. Catharines, ON L2S 3A1, Canada]

78-001469 Hughes, G. M. ON THE RESPIRATION OF /TORPEDO MARMORATA/. J. Exp. Biol. 73: 85-105. Apr. 1978. SFA 23(3)
[Res. Unit Comp. Anim. Respiration, Univ. Bristol, Woodland Road, Bristol BS8 1UG, England]

78-001470 Hughes, G. M.; Johnston, I. A. SOME RESPONSES OF THE ELECTRIC RAY (/TORPEDO MARMORATA/) TO LOW AMBIENT OXYGEN TENSIONS. J. Exp. Biol. 73: 107-117. Apr. 1978. SFA 23(3)
[Res. Unit Comp. Anim. Respiration, Univ. Bristol, Woodland Road, Bristol BS8 1UG, England]

78-001471 Hulbert, W. C.; Moon, T. W.; Hochachka, P. W. THE ERYTHRINID GILL: CORRELATIONS OF STRUCTURE, FUNCTION, AND METABOLISM. Can. J. Zool. 56 (4): 814-819. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-001472 Hulbert, W. C.; Moon, T. W.; Bailey, J.; Hochachka, P. W. THE OCCURRENCE AND POSSIBLE SIGNIFICANCE OF CHLORIDELIKE CELLS IN THE NEPHRON OF AMAZON FISHES. Can. J. Zool. 56 (4): 833-844. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-001473 Hulbert, W. C.; Moon, T. W.; Hochachka, P. W. THE OSTEOGLOSSID GILL: CORRELATIONS OF STRUCTURE, FUNCTION, AND METABOLISM WITH TRANSITION TO AIR BREATHING. Can. J. Zool. 56 (4): 801-808. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-001474 Iga, T. POTASSIUM-INDUCED MELANOSOME DISPERSION IN MELANOPHORES OF /ORYZIAS LATIPES/ IS INDEPENDENT OF ADRENERGIC MECHANISMS. Annot. Zool. Jpn. 50 (4): 195-202. Dec. 1977. SFA 23(3)
[Dep. Biol., Fac. Lit. Sci., Shimane Univ., Matsue, Shimane 690, Japan]

78-001475 Isaacks, R. E.; Kim, H. D.; Harkness, D. R. INOSITOL DIPHOSPHATE IN ERYTHROCYTES OF THE LUNGFISH, /LEPIDOSIREN PARADOXA/, AND 2,3-DIPHOSPHOGLYCERATE IN ERYTHROCYTES OF THE ARMORED CATFISH, /PTERYGOPLICHTYS/ SP. Can. J. Zool. 56 (4): 1014-1016. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Med., Univ. Miami Sch. Med., Miami, FL 33125]

78-001476 Isaacks, R. E.; Kim, H. D.; Harkness, D. R. RELATIONSHIP BETWEEN PHOSPHORYLATED METABOLIC INTERMEDIATES AND WHOLE BLOOD OXYGEN AFFINITY IN SOME AIR-BREATHING AND WATER-BREATHING TELEOSTS. Can. J. Zool. 56 (4): 884-890. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Med., Univ. Miami Sch. Med., Miami, FL 33125]

78-001477 Iwamatsu, T.; Fujieda, R. STUDIES ON OOCYTE MATURATION OF THE MEDAKA, /ORYZIAS LATIPES/. IV. EFFECT OF TEMPERATURE ON PROGESTRERONE- AND GONADOTROPIN-INDUCED MATURATION. Annot. Zool. Jpn. 50 (4): 212-219. Dec. 1977. SFA 23(3)
[Dep. Biol., Aichi Univ. Educ., Igaya-cho, Kariya-shi, Aichi 448, Japan]

78-001478 Izower, J. A STUDY OF POSTURAL, LOCOMOTORY, AND ASSOCIATIVE FUNCTIONS OF THE /CORPUS CEREBELLI/, /VALVULA CEREBELLI/, AND /EMINENTIA GRANULARIS/ IN THE CICHILID TELEOST /AEQUIDENS LATIFRONS/ (STEINDACHNER). Ph.D. dissertation, N.Y. Univ. 243p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(4):1513. Oct. 1977. SFA 23(3)

78-001479 Jafri, A. K.; Khawaja, D. K. SEASONAL VARIATIONS OF TISSUE CALCIUM AND PHOSPHORUS IN THE JUVENILES OF THE CATFISH, /WALLAGO ATTU/ (BL. AND SCHN.). Indian J. Fish. 22 (1,2): 221-224. 1975. SFA 23(3)
[Dep. Zool., Aligarh Muslim Univ., Aligarh, India]

78-001480 Jansen, W. F.; van Dort, J. B. FURTHER INVESTIGATIONS ON THE STRUCTURE AND FUNCTION OF THE SACCUS VASCULOSUS OF THE RAINBOW TROUT, /SALMO GAIRDNERI/ RICHARDSON. ULTRASTRUCTURAL CYTOCHEMISTRY OF MEMBRANE-BOUND ALKALINE PHOSPHATASE. Cell Tissue Res. 187 (1): 61-68. 1978. SFA 23(3)
[Zool. Lab., State Univ. Utrecht, Transitorium III, Padualaan 8, Utrecht, The Netherlands]

78-001481 Jaspers, E. J.; Avault, J. W., Jr.; Roussel, J. D. TESTICULAR AND SPERMATOZOAL CHARACTERISTICS OF CHANNEL CATFISH, /ICTALURUS PUNCTATUS/, OUTSIDE THE SPAWNING SEASON. Trans. Am. Fish. Soc. 107 (2): 309-315. Mar. 1978. SFA 23(3)
[I.Z.W.O., 69 Prinses Elisabethlaan, 8401 Bredene, Belgium]

78-001482 Johansen, K.; Mangum, C. P.; Weber, R. E. REDUCED BLOOD O(2) AFFINITY ASSOCIATED WITH AIR BREATHING IN OSTEOGLOSSID FISHES. Can. J. Zool. 56 (4): 891-897. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zoophysiol., Univ. Aarhus, DK-8000 Aarhus C., Denmark]

78-001483 Johansen, K.; Mangum, C. P.; Lykkeboe, G. RESPIRATORY PROPERTIES OF THE BLOOD OF AMAZON FISHES. Can. J. Zool. 56 (4): 898-906. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zoophysiol., Univ. Aarhus, DK-8000 Aarhus C., Denmark]

78-001484 Johnston, I.; Lucking, M. TEMPERATURE INDUCED VARIATION IN THE DISTRIBUTION OF DIFFERENT TYPES OF MUSCLE FIBRE IN THE GOLDFISH (/CARASSIUS AURATUS/). J. Comp. Physiol. B Biochem. Syst. Environ. Physiol. 124 (2): 111-116. 1978. SFA 23(3)
[Dep. Physiol., Univ .St. Andrews, St. Andrews, Fife, Scotland]

78-001485 Joshi, B. D.; Tandon, R. S. THE CORRELATION OF BODY SIZE AND SOME HAEMATOLOGIC VALUES OF THE FRESH WATER FISH. I. /CLARIAS BATRACHUS/ (L.). J. Anim. Morphol. Physiol. 24 (2): 339-343. Dec. 1977. SFA 23(3)
[Dep. Zool., Hindu Coll., Moradabad, India]

78-001486 Kachina, T. F. FEATURES OF THE RATE OF SEXUAL MATURATION OF THE PACIFIC HERRING, /CLUPEA HARENGUS PALLASI/, AS EXEMPLIFIED BY THE KORFA-KARAGA POPULATION. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 267-276. 1977. SFA 23(3)
[KoTINRO, Petropavlovsk-Kamchatskiy, USSR] In the Pacific herring, both within the species and within the individual population, three types of correlations between length increase, condition factor and maturation rate are observed: 1) accelerated growth, high conditon factor, accelerated maturation; 2) retarded growth, low conditoin factor, retarded maturation; 3) delayed growth, high condition factor, accelerated maturation. The rate of maturation is more closely connected with the condition factor than with length increase. Acceleration of gonadal maturation under conditons of a poor food supply is achieved by prolonging foraging by 2-4 months during the autumn-winter period.--Concl.

78-001487 Kah, O.; Chambolle, P.; Olivereau, M. INNERVATION AMINERGIQUE HYPOTHALAMO-HYPOPHYSAIRE CHEZ /GAMBUSIA/ SP. (TELEOSTEEN POECILIDE) ETUDIEE PAR DEUX TECHNIQUES DE FLUORESCENCE. [AMINERGIC INNERVATION OF THE HYPOTHALAMO-HYPOPHYSEAL SYSTEM IN /GAMBUSIA/ SP. (TELEOST, POECILIDAE) STUDIED BY TWO FLUORESCENCE TECHNIQUES.] C. R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat. 286 (9): 705-708. 6 Mar. 1978. In French with English summ. SFA 23(3)
[Lab. Biol. Anim. A, Cent. Morphol. Exp., C.N.R.S., ave. des Facultes, 33405 Talence Cedex, France]

78-001488 Karzinkin, G. S. , (ed.) METABOLISM AND BIOCHEMISTRY OF FISHES. Translated from Russian and published for the U.S. Department of the Interior, Fish and Wildlife Service and the National Science Foundation, Washington, D.C., by the Indian National Scientific Documentation Centre, Hillside Road, New Delhi, India. 552p. 1977. SFA 23(3)
Limited copies available from Editorial Office, USFWS, Aylesworth Hall-CSU, Fort Collins, CO 80523. This book contains articles on the different aspects of fish metabolism--protein, carbohydrate, and lipid--in relation to reproduction and population dynamics. The role has been established of the biology of active microfactors of feed in metabolism. Data are presented on fish biochemistry: biochemical composition of muscles, blood, serology, and immunity. Appropriate methods of investigation have been described. This material presented to the Conference on the Ecological Physiology of Fish is designed for the use of physiologists, ichthyologists, and fish breeders.

78-001489 Kent, B.; Peirce, E. C. II CARDIOVASCULAR RESPONSES TO CHANGES IN BLOOD GASES IN DOGFISH SHARK, /SQUALUS ACANTHIAS/. Comp. Biochem. Physiol. C Comp. Pharmacol. 60 (1): 37-44. 1978. SFA 23(3)
[Dep. Surgery, Bronx Vet. Admin. Hosp., 130 W. Kingsbridge Rd. Bronx, NY 10468]

78-001490 Khlebovich, V. V.; Vinogradov, G. A.; Dirin, D. K.; L'vova, T. G. SODIUM AND CALCIUM METABOLISM OF PINK SALMON (/ONCORHYNCHUS GORBUSCHA/) EGGS DURING THE FIRST FEW HOURS AFTER FERTILIZATION IN WATERS DIFFERING IN THEIR CONTENT OF DISSOLVED SALTS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 504-507. 1977. SFA 23(3)
[Zool. Inst., USSR Acad. Sci., Leningrad, USSR]

78-001491 Kikuchi, T.; Honda, H.; Ishikawa, M.; Yamanaka, H.; Amano, K. [EXCRETION OF MERCURY FROM FISH.] Bull. Jpn. Soc. Sci. Fish. 44 (3): 217-222. Mar. 1978. SFA 23(3)
[Tokyo Univ. Fish., Konan 4, Minato-ku, Japan] In the first series, conger eel, caught from Kagoshima Bay, which had natural levels of mercury of 1.0 ppm in the msucle tissue, 0.67 ppm in the spleen, and 1.8 ppm in the liver, were kept in plain sea water and fed with raw fish flesh for seven weeks. The mercury levels were reduced to one-half in 5 weeks for the muscle and spleen, and in 3 weeks for the liver. In the second series, sea bream were fed for 7 weeks with pellets containing either methyl mercury or mercuric chloride at a level of 1.0 ppm, and subsequently fed with either commercial pellet feed or pellets impregnated by a mixture of cysteine, pectin, and chitosan for another 7 weeks. The mercury concentrations at the end of the first feeding period were 0.9 ppm in the kidney and 0.25-0.4 ppm in the muscle, liver, brain, and spleen. However, during the subsequent feeding period, the mercury level was reduced to a level less than 0.2 ppm in every tissue examined, with best results in the

78-001491 CONTINUED
group fed with the pellets supplemented by the mixture mentioned. In the case of feeding with pellets containing mercuric chloride, the mercury level in any part hardly reached the level of 0.2 ppm, even after a 7 weeks' period. This may suggest that mercury in this chemical form will excrete readily.--From abstr.

78-001492 Kim, H. D.; Isaacks, R. E. THE MEMBRANE PERMEABILITY OF NONELECTROLYTES AND CARBOHYDRATE METABOLISM OF AMAZON FISH RED CELLS. Can. J. Zool. 56 (4): 863-869. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Physiol., Coll. Med., Univ. Ariz., Tucson 85724]

78-001493 Kim, H. D.; Isaacks, R. E. THE OSMOTIC FRAGILITY AND CRITICAL HEMOLYTIC VOLUME OF RED BLOOD CELLS OF AMAZON FISHES. Can. J. Zool. 56 (4): 860-862. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Physiol., Coll. Med., Univ. Ariz., Tucson 85724]

78-001494 Koch, H. J.; Bergstrom, E. PLASMA CHOLESTEROL IN THE PRECOCIOUS MALES OF /SALMO SALAR/ (L.). IN H. Peeters, ed. Protides of the Biological Fluids, Proc. 25th Colloq., Pergamon Press, Oxford and New York. 483-486. 1978. SFA 23(3)
[Univ. Leuven, Belgium]

78-001495 Komourdjian, M. P.; Burton, M. P.; Idler, D. R. GROWTH OF RAINBOW TROUT, /SALMO GAIRDNERI/, AFTER HYPOPHYSECTOMY AND SOMATOTROPIN THERAPY. Gen. Comp. Endocrinol. 34 (2): 158-162. Feb. 1978. SFA 23(3)
[Mar. Sci. Res. Lab., Memorial Univ., St. John's NF A1C 5S7, Canada]

78-001496 Kotov, A. M. FEATURES OF THE CARBOHYDRATE METABOLISM IN THE BLOOD OF SOME BLACK SEA FISHES AT DIFFERENT TIMES OF THE YEAR. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 331-333. 1977. SFA 23(3)
[All-Union Res. Inst. Sea Fish. Oceanogr., Batumi, USSR]

78-001497 Kramer, D. L.; Lindsey, C. C.; Moodie, G. E. E.; Stevens, E. D. THE FISHES AND THE AQUATIC ENVIRONMENT OF THE CENTRAL AMAZON BASIN, WITH PARTICULAR REFERENCE TO RESPIRATORY PATTERNS. Can. J. Zool. 56 (4): 717-729. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Biol., McGill Univ., 1205 McGregor Ave., Montreal, PQ H3A 1B1, Canada]

78-001498 Kramer, D. L. VENTILATION OF THE RESPIRATORY GAS BLADDER IN /HOPLERYTHRINUS UNITAENIATUS/ (PISCES, CHARACOIDEI, ERYTHRINIDAE). Can. J. Zool. 56 (4): 931-938. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Biol., McGill Univ., 1205 McGregor Ave., Montreal, PQ H3A 1B1, Canada]

78-001499 Krayushkina, L. S.; Moiseyenko, S. N. FUNCTIONAL CHARACTERISTICS OF OSMOREGULATION IN ECOLOGICALLY DIFFERENT SPECIES OF STURGEONS (ACIPENSERIDAE) IN A HYPERTONIC ENVIRONMENT. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 441-447. 1977. SFA 23(3)
[Leningrad Univ., USSR] The characteristics of the osmoregulation of freshwater and diadromous members of the family Acipenseridae in the course of their adaptation to a salinity of 10.5-12.5°/oo were compared on the basis of measurements of the concentration of osmotically active substances in the blood serum (having regard to changes in the concentration of sodium and urea).

78-001500 Kumagai, H.; Saiki, K. [PATTERNS OF INCREASING MERCURY CONTENT WITH GROWTH FOR WILD AND CULTURED RED SEA BREAMS, /CHRYSOPHYS MAJOR/.] Bull. Jpn. Soc. Sci. Fish. 44 (3): 269-272. Mar. 1978. In Japanese with English summ. SFA 23(3)
[Yamaguchi Pref. Res. Inst. Health, Aoi, Yamaguchi City, Japan] In both the dorsal and the ventral flesh of the wild fish, the total content of mercury increased exponentially with an increase of the body length. On the other hand, in the dorsal flesh of the cultured fish an equimolecular relation was obtained. The ratio of methyl mercury to the total amount of mercury, in the wild fish, increased with increasing the body length, as opposed to the constancy of this ratio in the case of the cultured fish. From these results, it was concluded that the difference in mercury levels between the wild and cultured fish may be derived from the difference in diets. In addition, it was shown that the alkyl mercury in these fish is predominantly methyl mercury, while ethyl and butyl mercury are not detected.--From abstr.

78-001501 Kunze, J.; Buhringer, H.; Harms, U. ACCUMULATION OF COBALT DURING EMBRYONIC DEVELOPMENT OF RAINBOW TROUT (/SALMO GAIRDNERI/ RICH.). Aquaculture 13 (1): 61-66. Jan. 1978. SFA 23(3)
[Fed. Res. Cent. Fish., Isotope Lab., Wustland 2, 2000 Hamburg 55, West Germany] Studies on the accumulation of cobalt by fish eggs are described. gamma-Energy measurement of ^{57}Co and atomic absorption with the flameless technique were used for the detection of the cobalt. The cobalt level of the eggs was found to be directly proportional to the cobalt content of the aquatic medium, and its uptake decreased with increasing calcium ion concentration in the water. The accumulation of bivalent cobalt ions was found to take place on the surface of the eggs, where they are reversibly bound by the binding force of chorion-mucopolysaccharide. The present study did not show any increase in cobalt content within the larvae that hatched from the eggs.

78-001502 Kuz'min, A. N.; Krupkin, V. Z. DEVELOPMENT OF THE FEMALE REPRODUCTIVE SYSTEM IN THE MUKSUN (/COREGONUS MUKSUN/) WHEN REARED IN THE NORTHWEST OF THE USSR. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (6): 940-948. 1976. SFA 23(3)
[GosNIORKh, Leningrad, USSR] When the muksun is reared in ponds and in lakes without through flow in the Northwest of the USSR its reproductive system develops without disturbance, and the morphological manifestation of development of the female gametes is extremely similar to oogenesis in other fishes and fully in accordance with the pattern of this precess common to all fishes. The muksun reaches sexual maturity 2-3 years earlier in waters in the Northwest than in the parental water. It takes one year-class of females 5-6 years to mature. The trophoplasmic growth period of the oocytes lasts 14-15 months in females maturing for the first time, but this period is 6 months in mature females with an annual sexual cycle. The ovaries enter maturity state II after spawning. The 2nd year and 3rd year

78-001502 CONTINUED
periodicity in the maturation of mature females to be observed in Siberian rivers is not a hereditary factor. It has been experimentally established that females may mature annually and in part after an interval of one and two years. The age at which the muksun reaches sexual maturity is not dependent on growth rate, but is determined by the conditions under which the fish develops, primarily the thermal regime of the habitats.

78-001503 Kuz'mina, V. V. PECULIARITIES OF THE MEMBRANE DIGESTION IN FRESHWATER TELEOSTS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 99-107. 1977. SFA 23(3)
[Inst. Biol. Inland Waters, Borok, USSR] By means of the method of alpha-amylase desorption from a gut section it is demonstrated on 12 species of freshwater teleosts that the relation of the activity of alpha-amylase adsorbed by the intestinal mucosa and the activity of the unsorbed enzyme changes seasonally, reaching its maximum in most fish in summer. The kinetics of desorption of alpha-amylase differs in non-predatory and predatory fish. Kinetic characteristics may vary between individuals of a species differing in diet.

78-001504 Laming, P. R.; Savage, G. E. FLOW CHANGES IN VISCERAL BLOOD VESSELS OF THE CHUB (/LEUCISCUS CEPHALUS/) DURING BEHAVIOURAL AROUSAL. Comp. Biochem. Physiol. A Comp. Physiol. 59 (3): 291-293. 1978. SFA 23(3)
[Dep. Zool., Queen's Univ., Belfast, Northern Ireland] Observations were made of ECGs and the flow in some abdominal blood vessels, in the chub /Leuciscus cephalus/, with implanted electrodes and a flow cuff respectively. Visual and tactile stimuli given to the fish caused behavioural arousal accompanied by a reduction in heart rate, a reduction in mean flow, and an increase in its pulsatile amplitude. The results were discussed in relation to cardiovascular changes occurring during fright.

78-001505 Landreth, G. E. EXPLANT CULTURE OF THE ADULT GOLDFISH RETINA. Ph.D. dissertation, Univ. Mich. 283p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(6):2484. Dec. 1977. SFA 23(3)

78-001506 Lanzing, W. J. R. EFFECT OF METHALLIBURE ON GONAD DEVELOPMENT AND CAROTENOID CONTENT OF THE FINS OF /SAROTHERODON MOSSAMBICUS/ (/TILAPIA MOSSAMBICA/). J. Fish Biol. 12 (2): 181-185. Feb. 1978. SFA 23(3)
[Sch. Biol. Sci., Univ. Sydney, Australia] Juvenile /Sarotherodon mossambicus/ were exposed to a daily dose of 1 or 2 p.p.m. of the antigonadotropic drug methallibure for a period of seven weeks. The control fish all showed well-developed gonads and a considerable concentration of astaxanthin in the dorsal fins. The dominant male showed a much higher astaxanthin value than the other fishes. Methallibure completely prevented gonad development. Nevertheless, some astaxanthin deposition did occur in the drug-treated fish.

78-001507 Lapin, V. I. SEASONAL DYNAMICS OF LIPID COMPOSITION IN DIFFERENT SUBSPECIES AND FORMS OF THE FLOUNDER, /PLATICHTHYS FLESUS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 85-98. 1977. SFA 23(3)
[Dep. Ichthyol., Moscow Univ., USSR] The seasonal dynamics of the lipid composition of muscles, liver and gonads of the deep sea and coastal spawning forms of the Baltic subspecies of the flounder are investigated. A comparison of the seasonal dynamics of the lipid compostion in the Baltic, White Sea and Black Sea subspecies is given.

78-001508 Lavrova, Ye. A.; Natochin, Yu. V. THE KIDNEYS IN IONIC REGULATION AMONG FISHES INHABITING THE BRACKISH WATERS OF LAKE BALKHASH. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 500-503. 1977. SFA 23(3)
[I.M. Sechenov Inst. Evol. Physiol. Anim. Ecol., USSR Acad. Sci., Leningrad, USSR] It may be concluded from our research that a hyperosmotic type of regulation of water-salt metabolism is maintained in brackish water, the osmotic concentration of which is lower than in the body fluids of fishes. Despite the high concentration of individual ions (e.g. magnesium) in the water of such lakes, it probably does not enter the organism in appreciable quantity, as in marine fishes, and the functional organization of the water-salt balance is similar to that of freshwater fishes, but not to marine fishes.--From author.

78-001509 Law, W. M.; Ellender, R. D.; Wharton, J. H.; Middlebrooks, B. L. FISH CELL CULTURE: PROPERTIES OF A CELL LINE FROM THE SHEEPSHEAD, /ARCHOSARGUS PROBATOCEPHALUS/. J. Fish. Res. Board Can. 35 (4): 470-473. Apr. 1978. In English with French summ. SFA 23(3)
[R. D. Ellender: Dep. Microbiol., Univ. South Miss., Hattiesburg 39401]

78-001510 Lin, H.; Romsos, D. R.; Tack, P. I.; Leveille, G. A. DETERMINATION OF GLUCOSE UTILIZATION IN COHO SALMON [/ONCORHYNCHUS KISUTCH/ (WALBAUM)] WITH (6-^{3}H)- AND (U-^{14}C)-GLUCOSE. Comp. Biochem. Physiol. A Comp. Physiol. 59 (2): 189-191. 1978. SFA 23(3)
[Dep. Fish. Wildl., Mich. State Univ., East Lansing 48824]

78-001511 Lwowski, E. S. THE CORPUSCLES OF STANNIUS AND CALCIFIED TISSUES IN THE EEL, /ANGUILLA ROSTRATA/ (L.). Comp. Biochem. Physiol. A Comp. Physiol. 59 (2): 183-187. 1978. SFA 23(3)
[Dep. Physiol., Univ. Toronto, Toronto, ON, Canada]

78-001512 Mackie, A. M.; Adron, J. W. IDENTIFICATION OF INOSINE AND INOSINE 5'-MONOPHOSPHATE AS THE GUSTATORY FEEDING STIMULANTS FOR THE TURBOT, /SCOPHTHALMUS MAXIMUS/. Comp. Biochem. Physiol. A Comp. Physiol. 60 (1): 79-83. 1978. SFA 22(3)
[Nat. Environ. Res. Counc., Inst. Mar. Biochem., Aberdeen AB1 3RA, Scotland] A simple whole-animal bioassay was developed for the study of the feeding stimulants for the turbot /Scophthalmus maximus/. Certain nucleosides and nucleotides were found to act as specific feeding stimulants at low concentrations. The following molecular features were essential for activity: (i) purine ring; (ii) oxygen function on position 6; (iii) hydrogen or amino group on position 2; (iv) hydroxyl groups on 2' and 3' positions.

78-001513 Mangum, C. P.; Haswell, M. S.; Johansen, K.; Towle, D. W. INORGANIC IONS AND PH IN THE BODY FLUIDS OF AMAZON ANIMALS. Can. J. Zool. 56 (4): 907-916. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Biol., Coll. William and Mary, Williamsburg, VA 23185]

78-001514 Marquez, E. D. A COMPARISON OF LACTATE DEHYDROGENASE ISOZYMES IN TISSUES OF IMMATURE AND MATURE COHO SALMON (/ONCORHYNCHUS KISUTCH/). J. Exp. Zool. 203 (3): 475-481. Mar. 1978. SFA 23(3)
[Dep. Microbiol., M. S. Hershey Med. Cent., Pa. State Univ., Hershey 17033] Lactate dehydrogenase (LDH) isozymes from various tissues of mature and immature (fry) Coho salmon (/Oncorhynchus kisutch/) were compared. Brain isozymes from both appeared identical while minor differences were seen with isozymes from liver and heart. The most dramatic differences were observed in isozymes from muscle. Adult muscle displayed 8 discernible LDH isozymes while fry muscle displayed 7. Of these, fry muscle contained 2 predominant isozymes, one of which was specified by the B locus while the other was specified by the A locus. In adult muscle 3 predominant isozymes were seen and all were A locus associated. In addition, none of the predominant isozymes from adult and fry muscle were seen to comigrate.

78-001515 Martel, A. L. D.; Cech, J. J., Jr. PERIPHERAL VASCULAR RESISTANCE IN THE GILLS OF THE WINTER FLOUNDER /PSEUDOPLEURONECTES AMERICANUS/. Comp. Biochem. Physiol. A Comp. Physiol. 59 (4): 419-423. 1978. SFA 23(3)
[Dep. Zool., Univ. Mass., Amherst 01003]

78-001516 Matias, J. R.; Markofsky, J. THE SURVIVAL OF EMBRYOS OF THE ANNUAL FISH /NOTHOBRANCHIUS GUENTHERI/ EXPOSED TO TEMPERATURE EXTREMES AND THE SUBSEQUENT EFFECTS ON EMBRYONIC DIAPAUSE. J. Exp. Zool. 204 (2): 219-228. May 1978. SFA 23(3)
[Orentreich Found. Adv. Sci., Inc., 910 Fifth Ave., New York, NY 10021]

78-001517 Matthews, G.; Wickelgren, W. O. TRIGEMINAL SENSORY NEURONS OF THE SEA LAMPREY. J. Comp. Physiol. A Sens. Neural Behav. Physiol. 123 (4): 329-333. 1978. SFA 23(3)
[Dep. Physiol., Univ. Colo. Med. Cent., Denver 80262]

78-001518 McQuarrie, I. G. AXONAL REGENERATION IN THE GOLDFISH OPTIC SYSTEM: THE ROLE OF THE NERVE CELL BODY. Ph.D. dissertation, Cornell Univ. Med. Coll. 219p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(9):4095. Mar. 1978. SFA 23(3)

78-001519 Milne, R. S.; Leatherland, J. F. EFFECT OF OVINE TSH, THIOUREA, OVINE PROLACTIN AND BOVINE GROWTH HORMONE ON PLASMA THYROXINE AND TRI-IODOTHYRONINE LEVELS IN RAINBOW TROUT, /SALMO GAIRDNERI/. J. Comp. Physiol. B Biochem. Syst. Environ. Physiol. 124 (2): 105-110. 1978. SFA 23(3)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

78-001520 Moffatt, N. M. THERMAL EFFECTS ON THE SURVIVAL AND DEVELOPMENT OF EMBRYONIC GRUNIONS, /LEURESTHES SARDINA/ AND /L. TENUIS/. Ph.D. dissertation, Univ. Ariz. 103p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(3):1035. Sept. 1977. SFA 23(3)

The embryonic development of the Gulf grunion, /Leuresthes sardina/, and the California grunion, /L. tenuis/, is highly temperature dependent between 10 and 25°C. A reduced temperature dependence is noted at laboratory incubation temperatures above 25°C during all developmental stages, except hatching, for both species. Development of the Gulf grunion tends to be less temperature dependent than that of the California grunion. However, hatching is more dependent upon temperature in the Gulf grunion than in the California grunion. Gulf grunion embryos are ready to hatch earlier than California grunion embryos when both are incubated at temperatures greater than 20°C. the thermal tolerance limits of embryonic development of the Gulf grunion (15 to 32°C) are wider than those of the California grunion (18 to 30°C).--From abstr.

78-001521 Moon, T. W. THE CHARACTERIZATION OF ATPASES FROM THE GILL OF THE OSTEOGLOSSID /OSTEOGLOSSUM BICIRRHOSUM/ (ARUANA). Can. J. Zool. 56 (4): 795-800. Apr. 1978. In English with French summ. SFA 23(3)

[Dep. Biol., Univ. Ottawa, Ottawa, ON K1N 6N5, Canada]

78-001522 Morisawa, M.; Hirano, T. EFFECTS OF LAMBDA-PHENYLALANINE ON ALKALINE PHOSPHATASE ACTIVITY AND ION AND WATER ABSORPTION IN THE EEL INTESTINE. Comp. Biochem. Physiol. C Comp. Pharmacol. 59 (2): 111-115. 1978. SFA 23(3)

[Lab. Physiol., Ocean Res. Inst., Univ. Tokyo, Nakano, Tokyo 164, Japan]

78-001523 Moroz, I. Ye.; Luzhin, B. P. DYNAMICS OF METABOLISM IN THE EMBRYONIC AND EARLY POST-EMBRYONIC DEVELOPMENT OF THE CARP /CYPRINUS CARPIO/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (6): 964-970. 1976. SFA 23(3)

[State Res. Inst. Lake River Fish., Volgograd, USSR] A study was made of the dynamics of the content of dry matter, protein, non-protein nitrogen, lipid, glycogen and phosphorus (total, inorganic, acid-soluble and ATP) in the incubation of degummed carp (/Cyprinus carpio/) eggs in standard Weis apparatuses, and of the dynamics of these indicators in the incubation of adhesive and degummed eggs taken from a single female in experimental apparatuses of the type of the Schuster apparatus. Data are also given on the level of the indicators under investigation in the body of 10-day old carp larvae from natural spawning and from hatchery output. It is established that the degumming of eggs with PAS-G does not disrupt metabolic processes and does not have an adverse effect on the embryonic and post-embryonic development of the carp.

78-001524 Morton, W. D. THE EFFECTS OF SUB-LETHAL DOSES OF VALINOMYCIN, GRAMICIDIN D AND /M/-CHLOROCARBONYLCYANIDE PHENYLHYDRAZONE (CCP) ON THE HEAT RESISTANCE OF THE GOLDFISH, /CARASSIUS AURATUS/ L. Comp. Biochem. Physiol. C Comp. Pharmacol. 59 (1): 1-4. 1978. SFA 23(3)

[Dep. Biol., Queen's Univ., Kingston, ON K7L 3N6, Canada]

78-001525 Mukhamedova, A. F. THE LEVEL OF STANDARD METABOLISM OF YOUNG SILVER CARP, /HYPOPHTHALMICHTHYS MOLITRIX/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 292-299. 1977. SFA 23(3)
[State Res. Inst. Lake River Fish., Volgograd, USSR] The respiratory metabolism of young silver carp, /Hypophthalmichthys molitrix/, introduced into Tsimlyansk reservoir was studied. Determination of the rate and intensity of respiratory was made in relation to various development stanzas depending on the nature of the food. On the basis of empirical data the dependence between rate of respiratory metabolims and body weight was found and formulas for the mean level of standard metabolism of larvae and fingerling of the silver carp were calculated. The data presented may be used to calculate the daily rations of the young and to solve the question of the food supply of this acclimatized species under the conditions of Tsimlyansk reservoir.

78-001526 Murat, J. C.; Castilla, C.; Paris, H. INHIBITION OF GLUCONEOGENESIS AND GLUCAGON-INDUCED HYPERGLYCEMIA IN CARP (/CYPRINUS CARPIO/ L.). Gen. Comp. Endocrinol. 34 (2): 243-246. Feb. 1978. SFA 23(3)
[Lab. Ecophysiol. Anim., Univ. Paul Sabatier, 38, Rue des 36 Ponts, 31400 Toulouse, France]

78-001527 Nakagawa, H.; Kayama, M. BIOCHEMICAL STUDIES ON CARP PLASMA PROTEIN--II. AMINO ACID COMPOSITION OF AN ALBUMIN. Bull. Jpn. Soc. Sci. Fish. 44 (3): 259-262. Mar. 1978. SFA 23(3)
[Dep. Fish., Fac. Fish. Anim. Husb., Hiroshima Univ., Fukuyama, Japan]

78-001528 Nakagawa, H. CLASSIFICATION OF ALBUMIN AND GLOBULIN IN YELLOW TAIL PLASMA. Bull. Jpn. Soc. Sci. Fish. 44 (3): 251-257. Mar. 1978. SFA 23(3)
[Dep. Fish., Fac. Fish. Anim. Husb., Hiroshima Univ., Fukuyama, Japan]

78-001529 Nordlie, F. G. THE INFLUENCE OF ENVIRONMENTAL SALINITY ON RESPIRATORY OXYGEN DEMANDS IN THE EURYHALINE TELEOST, /AMBASSIS INTERRUPTA/ BLEEKER. Comp. Biochem. Physiol. A Comp. Physiol. 59 (3): 271-274. 1978. SFA 23(3)
[Dep. Zool., Univ. Fla., Gainesville 32611] The rates of oxygen consumption of large /Ambassis interrupta/ are not significantly altered by salinity variations in the range from 10 percent to 100 percent sea water, while oxygen consumption of small individuals is increased in 70 percent sea water. It is suggested that there are 4 basic patterns of response in oxygen consumption of teleost fishes to altered salinity and adult /Ambassis/ demonstrate the pattern most adaptive to a euryhaline existence. Adult /Ambassis/ and other forms whose rates of oxygen consumption are little influenced by salinity variations show the least variation in plasma concentrations with varying salinities.

78-001530 Onoue, Y. CHARACTERIZATION OF SULFITE OXIDASE FROM PACIFIC HAKE. Ph.D. dissertation, Univ. Wash. 119p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(6):2477. Dec. 1977. SFA 23(3)

78-001531 Oven, L. S. FEATURES OF GAMETOGENESIS IN MALE MARINE TELEOSTS WITH PROTRACTED SPAWNING. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 46-58. 1977. SFA 23(3)

[InBYuM, Sevastopol, USSR] A histologic analysis of the testes of sexually mature fish from 36 species from the black Sea, Mediterranean and Red Sea was carried out. In the majority of the males of these fishes spawning is protracted. Characteristic of these fish is the changeover of the gonads to a state of functional maturity before completion of spermatogenesis in the majority of the ampullae. During the spawning season, the processes of spermatogenesis and spermiogenesis, the formation of the milt and its emission occur in parallel in the gonads of the males. Because of this, the supply of mature spermatozoa is continually replenished in the testes. This type of spermatogenesis contributes to extending the spawning season of the male and to an increase in sperm production.

78-001532 Parker, F. R., Jr. SEASONAL VARIATION IN SCHOOLING AND RESPIRATORY METABOLISM OF JUVENILF STRIPED MULLET, /MUGIL CEPHALUS/ L. Ph.D. dissertation, Univ. Tex. (Austin) 212p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(5):2064. Nov. 1977. SFA 23(3)

Results indicate that juvenile mullet experience considerable seasonal metabolic rate fluctuations, which are quite different from those of the adults. Standard rates ranged from 117 mgO(2)/kg/hr in the winter to 266 mgO(2)/kg/hr in the summer, while routine rates ranged from 145 mgO(2)/kg/hr in winter to 405 mgO(2)/kg/hr in summer. There was a significant (P less than 0.005) temperature response in all seasons, but the log oxygen response per °C, b(t) (average, 0.02), remained relatively constant throughout the year. There was no evidence of seasonal acclimatization as found in the adults. The salinity response was highly significant (P less than 0.005) in the standard metabolism, experiments, indicating a log-linear relationship which has not been reported for the adults. The differences in response to variables by the juveniles is attributed to the environmental restrictions placed on them by their stage of growth and development. The results of schooling experiments indicate lower routine metabolic responses (average of 15 percent lower seasonal metabolic rate) to changes in temperature and salinity. In effect this increases the "scope for routine activity" by providing a "buffer zone" which extends from the school routine metabolic level up to the individual routine metabolic level. As a behavicral response, schooling may be selectively utilized as variations in environmental pressure demands. Individual juvenile striped mullet exhibit significant diel variaticns in metabolism and activity. Daylight active metabolic rates (568 mgO(2)/kg/hr average) were significantly (P less than 0.005) higher than night rates (488 mgO(2)/kg/hr average) and a change in activity patterns, including a reduction in schooling tendencies, triggered by light intensity is suspected to be at least partially responsible for the day-night differences in metabolism.-- From abstr.

78-001533 Patton, J. S.; Haswell, M. S.; Moon, T. W. ASPECTS OF LIPID SYNTHESIS, HYDROLYSIS, AND TRANSPORT STUDIED IN SELECTED AMAZON FISH. Can. J. Zool. 56 (4): 787-792. Apr. 1978. In English with French summ. SFA 23(3)
[Harvard Med. Sch., Peter Bent Brigham Hosp., 721 Huntington Ave., Boston, MA 02115]

78-001534 Patzner, R. A. CYCLICAL CHANGES IN THE OVARY OF THE HAGFISH /EPTATRETUS BURGERI/ (CYCLOSTOMATA). Acta Zool. (Stockh.) 59 (1): 57-61. 1978. SFA 23(3)
[Zool. Inst., Univ. Salzburg, Akademiestrasse 26, A-5020, Salzburg, Austria]

78-001535 Patzner, R. A.; Ichikawa, T. THE EFFECTS OF HYPOPHYSECTOMY IN THE TESTIS OF THE HAYFISH, /EPTATRETUS BURGERI/ GIRARD (CYCLOSTOMATA). Zool. Anz. 199 (5/6): 371-380. 1977. SFA 23(3)

78-001536 Paulson, L. J. THE SIGNIFICANCE OF AMMONIA REGENERATION BY TROUT ON PHYTOPLANKTON PRODUCTIVITY IN CASTLE LAKE, CALIFORNIA. Ph.D. dissertation, Univ. Calif. (Davis) 197p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(10):4323. Apr. 1978. SFA 23(3)
The inputs and losses of nitrogen due to fish stocking and harvesting were determined from the nitrogen content of trout and creel census records. The net effect of these two processes resulted in a loss of 1.1 percent of the standing stock of inorganic and particulate nitrogen during the summer. This did not appear to adversely affect the nitrogen budget since the trout regenerated far more nitrogen than was lost by harvesting.--From abstr.

78-001537 Payan, P.; Pic, P.; de Renzis, G. COMPARAISON DES ECHANGES BRANCHIAUX DE CL EN EAU DOUCE CHEZ /SALMO GAIRDNERI/ IN VIVO ET IN VITRO SUR LA TETE ISOLEE PERFUSEE. [COMPARISON OF BRANCHIAL EXCHANGES OF CL IN /SALMO GAIRDNERI/ IN VIVO AND IN VITRO IN THE ISOLATED HEAD.] J. Fish. Res. Board Can. 35 (4): 477-479. Apr. 1978. In French with English summ. SFA 23(3)
[Fac. Sci., Nice 06034 France]

78-001538 Payan, P.; Girard, J.-P. MISE EN EVIDENCE D'UN ECHANGE NA /NH(4) DANS LA BRANCHIE DE LA TRUITE ADAPTEE A L'EAU DE MER: CONTROLE ADRENERGIQUE. [EVIDENCE OF NA /NH(4) EXCHANGE IN THE GILL OF TROUT ADAPTED TO SEA WATER.] C. R. Hebd. Seances Acad. Sci. Ser. D. Sci Nat. 286 (4): 335-338. 30 Jan. 1978. In French with English summ. SFA 23(3)
[Dep. Biol., Comm. Energie Atomique, Stn. Zool., 06230 Villefranche-sur-Mer, France]

78-001539 Payan, P. A STUDY OF THE NA /NH(4) EXCHANGE ACROSS THE GILL OF THE PERFUSED HEAD OF THE TROUT (/SALMO GAIRDNERI/). J. Comp. Physiol. B Biochem. Syst. Environ. Physiol. 124 (2): 181-188. 1978. SFA 23(3)
[Dep. Biol., Comm. Energie Atomique, Stn. Zool., F-06230 Villefranche-sur-Mer, France]

78-001540 Peignoux-Deville, J.; Milet, C.; Martelly, E. EFFETS DE L'ABLATION DU CORPS ULTIMOBRANCHIAL ET DE LA PERFUSION DE CALCITONINE SUR LES FLUX DE CALCIUM AU NIVEAU DES BRANCHIES DE L'ANGUILLE (/ANGUILLA ANGUILLA/ L.). [EFFECTS OF ABLATION OF THE ULTIMOBRANCHIAL BODY AND OF CALCITONIN PERFUSION ON CALCIUM INFLUX AND OUTFLUX IN THE GILLS OF THE EEL /ANGUILLA ANGUILLA/ L.] Ann. Biol. Anim. Biochim. Biophys. 18 (1): 119-126. 1978. In French with English summ. SFA 23(3)
[Mus. Natl. Hist. Nat., rue Cuvier 75005, Paris, France]

78-001541 Peute, J.; van der Gaag, M. A.; Lambert, J. G. D. ULTRASTRUCTURE AND LIPID CONTENT OF THE LIVER OF THE ZEBRAFISH, /BRACHYDANIO RERIO/, RELATED TO VITELLOGENIN SYNTHESIS. Cell Tissue Res. 186 (2): 297-308. 1978. SFA 23(3)
[Zool. Lab., Transitorium III, Padualaan 8, Utrecht, The Netherlands]

78-001542 Pfeiler, E. NA-ATPASE AND NAK-ATPASE ACTIVITIES IN GILLS OF RAINBOW TROUT (/SALMO GAIRDNERI/). J. Comp. Physiol. B Biochem. Syst. Environ. Physiol. 124 (2): 97-104. 1978. SFA 23(3)
[Inst. Tecnol. Estud. Super. Monterrey, Esc. Cienc. Mar. Tecnol. Aliment., Apartado Postal 484, Guaymas, Sonora, Mexico]

78-001543 Phleger, C. F. GILL PHOSPHOLIPIDS OF AMAZON FISHES. Can. J. Zool. 56 (4): 793-794. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Nat. Sci., San Diego State Univ., San Diego, CA 92182]

78-001544 Phleger, C. F.; Saunders, B. S. SWIM-BLADDER SURFACTANTS OF AMAZON AIR-BREATHING FISHES. Can. J. Zool. 56 (4): 946-952. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Nat. Sci., San Diego State Univ., San Diego, CA 92182]

78-001545 Pic, P. A COMPARATIVE STUDY OF THE MECHANISM OF NA AND CL EXCRETION BY THE GILL OF /MUGIL CAPITO/ AND /FUNDULUS HETEROCLITUS/: EFFECTS OF STRESS. J. Comp. Physiol. B Biochem. Syst. Environ. Physiol. 123 (2): 155-162. 1978. SFA 23(3)
[Stn. Mar. d'Endoume, rue Batterie des Lions, F-13007 Marseille, France]

78-001546 Plavis, G. W.; Piavis, M. G. IMPLANTATION OF AN ABDOMINAL WINDOW IN THE SEA LAMPREY, /PETROMYZON MARINUS/ (PISCES: PETROMYZONIDAE). Copeia 1978 (2): 349-352. 5 May 1978. SFA 23(3)
[Dep. Anat., Sch. Dent., Univ. Md., Baltimore 21201]

78-001547 Plisetskaya, E. M.; Leybush, B. N.; Bondareva, V. M.; Polyakova, T. I. FUNCTION OF THE PANCREATIC ISLET TISSUE OF THE SMALL-SCALED SCORPIONFISH (/SCORPAENA PORCUS/) UNDER THE INFLUENCE OF EXPERIMENTAL STIMULI. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 448-454. 1977. SFA 23(3)
[I. M. Sechenov Inst. Evol. Physiol. Biochem., Acad. Sci. USSR, Leningrad, USSR] Immunoreactive insulin (IRI) was found in the blood of the small-scaled scorpionfish (/Scorpaena porcus/) at different periods in the annual cycle. IRI level increases noticeably before spawning. The B cells of the islet tissue of the scorpionfish intensify their function under the influence of glucose loading, and

78-001547 CONTINUED
administration of the amino acid arginine and the hormone glucagon. In the minutes immediately following the administration of adrenalin insulin content is reduced in the blood, but thereafter increases. Parallel with the determination of IRI in the blood we traced morphological and histoautoradiographic changes in the B cells.

78-001548 Polenov, A. L.; Pavlovic, M. THE HYPOTHALAMO-HYPOPHYSIAL SYSTEM IN ACIPENSERIDAE: VII. THE FUNCTIONAL MORPHOLOGY OF THE PEPTIDERGIC NEUROSECRETORY CELLS IN THE PREOPTIC NUCLEUS OF THE STURGEON, /ACIPENSER GULDENSTADTI/ BRANDT. A QUANTITIVE STUDY. Cell Tissue Res. 186 (3): 559-570. 1978. SFA 23(3)
[Sechenov Inst., 194223 Leningrad K-223, USSR]

78-001549 Potter, I. C.; Wright, G. M.; Youson, J. H. METAMORPHOSIS IN THE ANADROMOUS SEA LAMPREY, /PETROMYZON MARINUS/ L. Can. J. Zool. 56 (4): 561-570. Apr. 1978. In English with French summ. SFA 23(3)
[Sch. Environ. Life Sci., Murdock Univ., Murdoch, Western Australia 6153, Australia]

78-001550 Potter, I. C.; Percy, R. C.; Youson, J. H. A PROPOSAL FOR THE ADAPTIVE SIGNIFICANCE OF THE DEVELOPMENT OF THE LAMPREY FAT COLUMN. Acta Zool. (Stockh.) 59 (1): 63-67. 1978. SFA 23(3)
[Sch. Environ. Life Sci., Murdoch Univ., Murdoch, Western Australia, 6153]

78-001551 Ramos, F.; Smith, A. C. KETONE BODIES IN FISH SKIN MUCUS AS AN INDICATOR OF STARVATION: A PRELIMINARY REPORT. J. Fish Biol. 12 (2): 105-108. Feb. 1978. SFA 23(3)
[Div. Social Sci., Univ. Hawaii, Hilo Coll., P.O. Box 1357, Hilo, 96720] The detection of starvation is a major problem in fish husbandry. Too often the discovery of starving animals is not made until pathogenic organisms are about to overcome the weakened animals. A simple test, using a commercial plastic strip with a reagent area that changes colour in the presence of starvation-induced ketones, was applied to this problem in the mullet, /Mugil cephalus/. The strip identified ketones in the fish skin mucus, and demonstrated its value in detecting starvation in fishes.

78-001552 Randall, D. J.; Farrell, A. P.; Haswell, M. S. CARBON DIOXIDE EXCRETION IN THE JEJU, /HOPLERYTHRINUS UNITAENIATUS/, A FACULTATIVE AIR-BREATHING TELEOST. Can. J. Zool. 56 (4): 970-973. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-001553 Randall, D. J.; Farrell, A. P.; Haswell, M. S. CARBON DIOXIDE EXCRETION IN THE PIRARUCU (/ARAPAIMA GIGAS/), AN OBLIGATE AIR-BREATHING FISH. Can. J. Zool. 56 (4): 977-982. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-001554 Rangneker, P. V.; Latey, A. N. INFLUENCE OF THE THYROID GLAND ON GONADAL ACTIVITY IN THE TELEOST, /TILAPIA MOSSAMBICA/ (PETERS). J. Anim. Morphol. Physiol. 24 (2): 344-352. Dec. 1977. SFA 23(3)
[Dep. Zool., Inst. Sci., Bombay-400 032, India]

78-001555 Riegel, J. A. FACTORS AFFECTING GLOMERULAR FUNCTION IN THE PACIFIC HAGFISH /EPTATRETUS STOUTI/ (LOCKINGTON). J. Exp. Biol. 73: 261-277. Apr. 1978. SFA 23(3)
[Westfield Coll., London NW3 7ST, England]

78-001556 Rush, S. B.; Umminger, B. L. ELIMINATION OF STRESS-INDUCED CHANGES IN CARBOHYDRATE METABOLISM OF GOLDFISH (/CARASSIUS AURATUS/) BY TRAINING. Comp. Biochem. Physiol. A Comp. Physiol. 60 (1): 69-73. 1978. SFA 23(3)
[Dep. Biol. Sci., Univ. Cincinnati, Cincinnati, OH 45221] When goldfish, /Carassius auratus/, acclimated to 37°C, are subjected to a mild handling stress, they respond with a hyperglycemia and a decrease in hepatic glycogen levels. These stress-induced changes in carbohydrate levels become evident 6 hr after the stress is applied and persist for less than 1 day. Hepatic glycogenolysis induced by the stress is not accompanied by an increase in the specific activity of glycogen phosphorylase. A training procedure, which accustoms the fish to handling by associating this process with feeding, abolishes the stress-induced changes in carbohydrate levels observed in untrained fish.

78-001557 Sakai, T.; Kawazu, H. PLASMA BILIRUBIN LEVELS IN RAINBOW TROUT AND CARP. Bull. Jpn. Soc. Sci. Fish. 44 (1): 85. 1978. SFA 23(3)
[Lab. Mar. Biochem., Fac. Agric., Univ. Tokyo, Bunkyo-ku, Tokyo, Japan]

78-001558 Sand, O.; Michelsen, A. VIBRATION MEASUREMENTS OF THE PERCH SACCULAR OTOLITH. J. Comp. Physiol. A Sens. Neural Behav. Physiol. 123 (1): 85-89. 1978. SFA 23(3)
[Inst. Zoophysiol., Univ. Oslo, Blindern, Oslo 3, Norway]

78-001559 Schade, R.; Kausch, H. UNTERSUCHUNGEN ZUR EXZESSFUETTERUNG VON JUNGEN KARPFEN (/CYPRINUS CARPIO/ L.) UNTER INTENSIVHALTUNGSBEDINGUNGEN. [INVESTIGATIONS ON EXCESS-FEEDING OF YOUNG CARP (/CYPRINUS CARPIO/ L.) KEPT UNDER INTENSIVE CULTURE CONDITIONS.] Arch. Hydrobiol. 82 (1/4): 522-550. 1978. In German with English summ. SFA 23(3)
[Limnol. Inst., Univ. Freiburg, Mainaustr. 212, 7750 Konstanz, West Germany] Satiation time, maximum weight of food consumed in a meal, loss of food at food intake, duration of intestinal passage and utilization of food in the intestine of 5-20 g wet weight carp (/Cyprinus carpio/ L.) fed to excess on trout pellets and kept under intensive culture conditions in a warm-water recirculation system are presented. A description of the used chromic oxide indicator method is given.

78-001560 Schlisio, W.; Nicolai, B. KINETIC INVESTIGATIONS ON THE BEHAVIOUR OF FREE AMINO ACIDS IN THE PLASMA AND OF TWO AMINOTRANSFERASES IN THE LIVER OF RAINBOW TROUT (/SALMO GAIRDNERII/ RICHARDSON) AFTER FEEDING ON A SYNTHETIC COMPOSITION CONTAINING PURE AMINO ACIDS. Comp. Biochem. Physiol. B Comp. Biochem. 59 (4): 373-379. 1978. SFA 23(3)
[Dep. Biol., Subdep. Anim. Physiol., Wilhelm Pieck Univ., Rostock, East Germany]

78-001561 Seki, N.; Hasegawa, E. [COMPARATIVE STUDIES ON FISH TROPONINS.] Bull. Jpn. Soc. Sci. Fish. 44 (1): 71-75. Jan. 1978. SFA 23(3)
[Lab. Biochem., Fac. Fish., Hokkaido Univ., Hakodate, Japan]

78-001562 Shcherbina, M. A.; Shcherbina, T. V.; Kazlauskene, O. P. AMYLASE ACTIVITY AND RATE OF CARBOHYDRATE RESORPTION WITH THE INTRODUCTION OF VARIOUS AMOUNTS OF FAT INTO THE DIET OF THE CARP, /CYPRINUS CARPIO/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 327-331. 1977. SFA 23(3)
[All-Union Pond Fish. Res. Inst., Rybnoye Postal Dist., Moscow Province, USSR]

78-001563 Shelton, W. L. FATE OF THE FOLLICULAR EPITHELIUM IN /DOROSOMA PETENENSE/ (PISCES: CLUPEIDAE). Copeia 1978 (2): 237-244. 5 May 1978. SFA 23(3)
[Ala. Coop. Fish Res. Unit, Auburn Univ., Auburn 36830] In most oviparous fishes, ovulation terminates the relationship of the developing ovum and its follicular attachment. However, in various fishes follicular contribution to the external egg layer is by secretion or transformation of the follicle cells. This paper illustrates the development and transformation of the follicular layer into a functional egg membrane. The highly adhesive egg capsule of /Dorosoma petenense/ is composed of the transformed ovarian follicular epithelium. The follicular epithelium of the oocytes develops from a loosely organized layer of cuboidal cells into a simple columnar cell layer, then into a granular layer, and finally into a layer with a radially-striated structure. This altered membrane was not ruptured at ovulation but remained intact throughout incubation and was the source of the egg's tenacious adhesiveness.

78-001564 Shen, A. C. Y.; Leatherland, J. F. EFFECT OF AMBIENT SALINITY ON IONIC AND OSMOTIC REGULATION OF EGGS, LARVAE, AND ALEVINS OF RAINBOW TROUT (/SALMO GAIRDNERI/). Can. J. Zool. 56 (4): 571-577. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. Guelph, Guelph, ON, Canada] The osmotic concentration of the perivitelline fluid in eggs of rainbow trout (/Salmo gairdneri/) was lower in eggs maintained in distilled water than in eggs maintained in dilute artificial sea water (11 percent and 13 percent). The water content of eggs, larvae, and alevins in distilled water was significantly higher than in comparable developmental stages in dilute sea water. Similarly, differences were found in the tissue Na^+, K^+, and Na^+:K^+ ratios of eggs, larvae, and alevins reared in the different ambient salinities. These data suggest that the early developmental stages of rainbow trout possess a limited capacity for osmotic or ionic regulation. Larvae appear to regulate tissue Na^+ content by increasing the Na^+ concentration of the perivitelline space and alevins tolerate an increase in tissue K^+ content and a small decrease in tissue water content.

78-001565 Sherman, W. R.; Simpson, P. C.; Goodwin, S. L. /SCYLLO/-INOSITOL AND /MYO/-INOSITOL LEVELS IN TISSUES OF THE SKATE /RAJA ERINACEA/. Comp. Biochem. Physiol. B Comp. Biochem. 59 (3): 201-202. 1978. SFA 23(3)
[Dep. Psychiatr. Biochem., Washington Univ. Sch. Med., St. Louis, MO 63110]

78-001566 Shimomura, M.; Seki, N. [SEPARATION AND PROPERTIES OF THE TROPONIN COMPONENTS FROM CARP MUSCLE.] Bull. Jpn. Soc. Sci. Fish. 44 (3): 231-238. Mar. 1978. In Japanese with English summ. SFA 23(3)
[Lab. Biochem., Fac. Fish., Hokkaido Univ., Hakodate, Japan]

78-001567 Shuttleworth, T. J. THE EFFECT OF ADRENALINE ON POTENTIALS IN THE ISOLATED GILLS OF THE FLOUNDER (/PLATICHTHYS FLESUS/ L.). J. Comp. Physiol. B Biochem. Syst. Environ. Physiol. 124 (2): 129-136. 1978. SFA 23(3)
[Dep. Biol. Sci., Univ. Exeter, Exeter, England]

78-001568 Smit, G. L.; Hattingh, J. THE EFFECT OF RESPIRATORY STRESS ON CARP HAEMOGLOBIN. Comp. Biochem. Physiol. A Comp. Physiol. 59 (4): 369-374. 1978. SFA 23(3)
[Dep. Zool., Rand Afrikaans Univ., Johannesburg, South Africa]

78-001569 Smith, D. G.; Gannon, B. J. SELECTIVE CONTROL OF BRANCHIAL ARCH PERFUSION IN AN AIR-BREATHING AMAZONIAN FISH /HOPLERYTHRINUS UNITAENIATUS/. Can. J. Zool. 56 (4): 959-964. Apr. 1978. In English with French summ. SFA 23(3)
[Zool. Dep., Univ. Melbourne, Parkville 3052, Victoria, Australia]

78-001570 Sorensen, D. L.; McCarthy, M. M.; Middlebrooks, E. J.; Porcella, D. B. SUSPENDED AND DISSOLVED SOLIDS EFFECTS ON FRESHWATER BIOTA: A REVIEW. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-77-042. x + 65p. Apr. 1977. SFA 23(3)
[Utah Water Res. Lab., Coll. Eng., Utah State Univ., Logan 84322]

78-001571 Spanovskaya, V. D.; Grigorash, V. A. ANALYSIS OF THE ONTOGENY OF REPRODUCTION IN FIRST-GENERATION FEMALES, WITH REFERENCE TO THE ROACH, /RUTILUS RUTILUS/, FROM MOZHAYSK RESERVOIR. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 35-45. 1977. SFA 23(3)
[Dep. Ichthyol., Moscow Univ., USSR] Data on long-term observations on the variation in biological indicators of three strong year-classes of the roach, /Rutilus rutilus/, from Mozhaysk reservoir are examined. Females of one year-class are qualitatively different as regards the level of generative metabolism which can be assessed according to relative fecundity. This qualitative difference leads to maturation at different times and to some females entering the spawning population being characterized by an exceptionally high generative metabolism and a short life, others by an average level of generative metabolism (as the females age it increases which leads to natural mortality) and yet others by a low generative metabolism and a long life span. The ratio between qualitatively differing females in different year-classes and populations can change depending on conditions of existence.

78-001572 Stevens, E. D.; Holeton, G. F. THE PARTITIONING OF OXYGEN UPTAKE FROM AIR AND FROM WATER BY ERYTHRINIDS. Can. J. Zool. 56 (4): 965-969. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. Toronto, Toronto, ON, Canada]

78-001573 Stevens, E. D.; Holeton, G. F. THE PARTITIONING OF OXYGEN UPTAKE FROM AIR AND FROM WATER BY THE LARGE OBLIGATE AIR-BREATHING TELEOST PIRARUCU (/ARAPAIMA GIGAS/). Can. J. Zool. 56 (4): 974-976. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

78-001574 Stevenson, S. V.; Grove, D. J. THE EXTRINSIC INNERVATION OF THE STOMACH OF THE PLAICE, /PLEURONECTES PLATESSA/ L. II. THE SPLANCHNIC NERVE SUPPLY. Comp. Biochem. Physiol. C Comp. Pharmacol. 60 (1): 45-50. 1978. SFA 23(3)
[Mar. Sci. Lab., Menai Bridge, Gwynedd, LL595EH, North Wales]

78-001575 Stolbov, A. Ya.; Alikin, Yu. S. TEMPERATURE DEPENDENCE OF ACTIVE METABOLISM AND SWIMMING SPEED OF THE BAIKAL GRAYLING, /THYMALLUS ARCTICUS BAICALENSIS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 178-179. 1977. SFA 23(3)
[Inst. Physiol., USSR Acad. Sci., Novosibirsk, USSR]

78-001576 Storey, K. B.; Guderley, H. E.; Guppy, M.; Hochachka, P. W. CONTROL OF AMMONIAGENESIS IN THE KIDNEY OF WATER- AND AIR-BREATHING OSTEOGLOSSIDS: CHARACTERIZATION OF GLUTAMATE DEHYDROGENASE. Can. J. Zool. 56 (4): 845-851. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Duke Univ., Durham, NC 27706]

78-001577 Strange, R. J. CHANGES IN PLASMA CORTISOL CONCENTRATION OF JUVENILE SALMONIDS DURING STRESS. Ph.D. dissertation, Oreg. State Univ. 104p. 1978. From Diss. Abstr. Int. B Sci. Eng. 38(10):4559. Apr. 1978. SFA 23(3)

78-001578 Tay, K.-L.; Garside, E. T. COMPENSATORY EMBRYOGENIC RESPONSES IN OSMOREGULATIVE STRUCTURES OF MUMMICHOG /FUNDULUS HETEROCLITUS/ L. INCUBATED AT CONSTANT TEMPERATURE AND VARIOUS CONSTANT LEVELS OF SALINITY. Can. J. Zool. 56 (4): 613-623. Apr. 1978. In English with French summ. SFA 23(3)
[Environ. Prot. Serv., 5151 George St., Halifax, NS B3J 1M5, Canada]

78-001579 Thornton, K. W.; Lessem, A. S. A TEMPERATURE ALGORITHM FOR MODIFYING BIOLOGICAL RATES. Trans. Am. Fish. Soc. 107 (2): 284-287. Mar. 1978. SFA 23(3)
[Environ. Effects Lab., U.S. Army Eng. Waterways Exp. Stn., Vicksburg, MS 39180]

78-001580 Tikhomirov, O. B. FAT METABOLISM DURING MUSCULAR ACTIVITY IN DIFFERENT AGE GROUPS OF THE RAINBOW TROUT, /SALMO GAIRDNERI/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 107-115. 1977. SFA 23(3)

[GosNIORKh, Leningrad, USSR] Data are presented on the dynamics of fat content in the tissues and on the concentration of non-esterified fatty acids (NEFA) in the blood of underyearling, yearling and 3rd-year rainbow trout, /Salmo gairdneri/, under the influence of strictly measured muscular loading. A decrease occurs in the fat content in the muscles and liver of fish of different age groups at different levels of muscular loading. An increase is observed in the level of NEFA in the blood of the trout of all age groups after one hour of swimming. An alteration in NEFA and glycemia levels occurs unidirectionally under the influence of muscular loading and there is a direct correlation between the concentration of these metabolites in the blood.

78-001581 Truscott, B.; Idler, D. R.; Sundararaj, B. I.; Goswami, S. V. EFFECTS OF GONADOTROPINS AND ADRENOCORTICOTROPIN ON PLASMATIC STEROIDS OF THE CATFISH, /HETEROPNEUSTES FOSSILIS/ (BLOCH). Gen. Comp. Endocrinol. 34 (2): 149-157. Feb. 1978. SFA 23(3)

[Mar. Sci. Res. Lab., Memorial Univ., St. John's, NF A1C 5S7, Canada]

78-001582 van den Hurk, R.; Peute, J.; Vermeij, J. A. J. MORPHOLOGICAL AND ENZYME CYTOCHEMICAL ASPECTS OF THE TESTIS AND VAS DEFERENS OF THE RAINBOW TROUT, /SALMO GAIRDNERI/. Cell Tissue Res. 186 (2): 309-325. 1978. SFA 23(3)

[J. Peute: Zool. Lab., Transitorium III, Padualaan 8, Utrecht, The Netherlands]

78-001583 van den Thillart, G.; Kesbeke, F. ANAEROBIC PRODUCTION OF CARBON DIOXIDE AND AMMONIA BY GOLDFISH /CARASSIUS AURATUS/ (L.). Comp. Biochem. Physiol. A Comp. Physiol. 59 (4): 393-400. 1978. SFA 23(3)

[Zool. Lab., Dep. Anim. Physiol., State Univ. Leiden, Kaiserstraat 63, Leiden, The Netherlands]

78-001584 Vislie, T. LYSOSOMES IN ERYTHROCYTES FROM THE FLOUNDER (/PLATICHTHYS FLESUS/). Comp. Biochem. Physicl. B. Comp. Biochem. 60 (1): 35-40. 1978. SFA 23(3)

[Zool. Inst., Univ. Oslo, Box 1050, Blindern, Oslo 3, Norway]

78-001585 Vlasblom, A. G.; Vaas, K. F.; Rozing, W. THE OSMOTIC CONCENTRATION OF THE BLOOD PLASMA OF PLAICE (/PLEURONECTES PLATESSA/) FROM THREE HABITATS OF DIFFERENT SALINITY. Neth. J. Sea Res. 11 (2): 168-183. Nov. 1977. SFA 23(3)

[Delta Inst. Hydrobiol. Res., Yerseke, The Netherlands]

78-001586 Vodicnik, M. J.; Kral, R. E.; de Vlaming, V. L.; Crim, L. W. THE EFFECTS OF PINEALECTOMY ON PITUITARY AND PLASMA GONADOTROPIN LEVELS IN /CARASSIUS AURATUS/ EXPOSED TO VARIOUS PHOTOPERIOD-TEMPERATURE REGIMES. J. Fish Biol. 12 (3): 187-196. Mar. 1978. SFA 23(3)
[V. L. de Vlaming: Dep. Biol., Marquette Univ., Milwaukee, WI 53233] The effects of pinealectomy on pituitary and plasma gonadotropin levels and gonadal development in female goldfish exposed to various photoperiod-temperature regimes during different seasons were examined. Pinealectomy during autumn had no effect on either pituitary or plasma hormone levels or gonadal development. When goldfish are pinealectomized in spring and exposed to long photoperiod conditions, the ovaries regress and plasma gonadotropin levels are significantly depressed compared to sham operated animals. Sham operated goldfish exposed to short photoperiod conditions in spring had regressing ovaries whereas pinealectomized animals under this regime either spawned or had ovaries in the late vitellogenic phase. Plasma gonadotropin titres in the pinealectomized group were significantly lower than those of sham operated animals. The pineal can be either stimulatory or inhibitory to gonadal development depending on the photoperiod regime to which the animals are exposed. The pineal apparently influences gonadal activity by modulating gonadotropin secretion. A diurnal variation in plasma gonadotropin levels was also observed in both sham operated and pinealectomized goldfish exposed to a long photoperiod-warm temperature regime in spring.

78-001587 Voss, E. W., Jr.; Fryer, J. L.; Banowetz, G. M. ISOLATION, PURIFICAITON, AND PARTIAL CHARACTERIZATION OF A LECTIN FROM CHINOOK SALMON OVA. Arch. Biochem. Biophys. 186 (1): 25-34. Feb. 1978. SFA 23(3)
[Dep. Microbiol., Univ. Ill., Urbana 61801]

78-001588 Wakamatsu, Y. LIGHT-SENSITIVE FISH MELANOPHORES IN CULTURE. J. Exp. Zool. 204 (2): 299-304. May 1978. SFA 23(3)
[Biol. Lab., Yoshida Coll., Kyoto Univ., Kyoto 606, Japan] Dermal melanophores in the skin from embryos and young fishes of the black platyfish, /Xiphophorus maculatus/, were dissociated and cultured in a monolayer. Melanosomes in the melanophores were dispersed in culture. Some of the cultured melanophores directly responded to light by producing reversible melanosome aggregation within a few minutes. A dose-response relationship was found between light intensity and time required for melanosome aggregation.

78-001589 Weiss, R. E.; Leeth, B. D.; Watabe, N. BONE RESORPTION IN FISH--AN ULTRASTRUCTURAL STUDY. Bull. S.C. Acad. Sci. 40: 91-92. 1978. Abstract only. SFA 23(3)
[Dep. Biol., Univ. S. Car., Columbia]

78-001590 Windell, J. T.; Foltz, J. W.; Sarokon, J. A. METHODS OF FECAL COLLECTION AND NUTRIENT LEACHING IN DIGESTIBILITY STUDIES. Prog. Fish-Cult. 40 (2): 51-55. Apr. 1978. SFA 23(3)
[Dep. Environ. Popul. Organ. Biol., Univ. Colo., Boulder 80309]

78-001591 Wolters, W. R.; Bulow, F. J. THE INFLUENCE OF TEMPERATURE ON FEEDING-GROWTH RELATIONSHIPS OF THE BLUEGILL, /LEPOMIS MACROCHIRUS/. J. Tenn. Acad. Sci. 53 (2): 74-75. Apr. 1978. Abstract only. SFA 23(3)

[Tenn. Tech. Univ., Cookeville] Bluegills (/Lepomis macrochirus/) were held at uniform temperatures of 10, 15, 20, 25, 30 and 33 C and fed to satiation for two weeks. Food consumption rate increased with temperatrue to a peak at 30 C and then declined at 33 C. Relative growth rate showed a similar pattern, but with a peak at 25 C. Peak conversion efficiency or efficiency of utilization of food for growth also occurred at 25 C. Maintenance requirements or amount of food needed to maintain a constant body weight steadily increased with temperature. Epaxial muscle RNA-DNA ratios reflected trends in food consumption and growth, verifying the ratio as an indicator of short-term growth rate.

78-001592 Wright, G. M.; Filosa, M. F.; Youson, J. H. LIGHT AND ELECTRON MICROSCOPIC IMMUNOCYTOCHEMICAL LOCALIZATION OF THYROGLOBULIN IN THE THYROID GLAND OF THE ANADROMOUS SEA LAMPREY, /PETROMYZON MARINUS/ L., DURING ITS UPSTREAM MIGRATION. Cell Tissue Res. 187 (3): 473-478. 1978. SFA 23(3)

[Dep. Zool., Scarborough Coll., Univ. Toronto, Toronto, ON M1C 1A4, Canada]

78-001593 Wright, M. I.; Davis, K. B. EFFECT OF ACCLIMATION TEMPERATURE ON MALATE DEHYDROGENASE ACTIVITY IN CHANNEL CATFISH, /ICTALURUS PUNCTATUS/. J. Tenn. Acad. Sci. 53 (2): 73-74. Apr. 1978. Abstract only. SFA 23(3)

[Memphis State Univ., Memphis, TN] The cellular mechanisms by which poikilothermic organisms acclimate to a wide variety of temperatures are poorly understood. The possible mechanisms of adaptation may include the presence of isozymes with different temperature optima or an increase in the number of enzyme molecules. Malate dehydrogenase (MDH) activity was measured from liver extracts of channel catfish acclimated at 10°C and 30°C for three weeks. Enzyme activity and electrophoretic analyses were determined at 10°, 25°, and 30°C. Enzyme activity from both groups of fish increased with increasing assay temperature. Enzyme activity was greater from fish acclimated to 10°C than 30°C at all three assay temperatures. Electrophoretic mobility of MDH indicated only one form, however, stain density was consistently more intense in extracts from fish acclimated at 10°C. These data suggest that acclimation to low temperature in channel catfish results in an increased number of MDH molecules, and not induction of an MDH isozyme.

78-001594 Yakovleva, K. K.; Shul'man, G. Ye. THE RATIO BETWEEN LIPID CONTENT AND MOISTURE CONTENT IN THE LIVER AND MUSCLES OF THE SCORPIONFISH (/SCORPAENA PORCUS/). J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.) 16 (6): 1037-1038. 1976. SFA 23(3)

[Ukranian Acad. Sci., Sevastopol, USSR]

78-001595 Yamamoto, Y.; Ishii, T.; Ikeda, S. [STUDIES ON COPPER METABOLISM IN FISHES--III. EXISTENCE OF METALLOTHIONEIN-LIKE PROTEIN IN CARP HEPATOPANCREAS.] Bull. Jpn. Soc. Sci. Fish. 44 (2): 149-153. Feb. 1978. In Japanese with English summ. SFA 23(3)
[Dep. Fish., Fac. Agric., Kyoto Univ., Kyoto, Japan]

78-001596 Yamauchi, H.; Matsuo, M.; Yoshida, A.; Orimo, H. EFFECT OF EEL CALCITONIN ON SERUM ELECTROLYTES IN THE EEL /ANGUILLA JAPONICA/. Gen. Comp. Endocrinol. 34 (3): 343-346. Mar. 1978. SFA 23(3)
[Toyo Jozo Res. Lab., Ohito-cho Tagata-gun, Shizuoka 410-23, Japan]

78-001597 Yoshinaka, R.; Sato, M.; Ikeda, S. DISTRIBUTION OF COLLAGENASE IN THE DIGESTIVE ORGANS OF SOME TELEOSTS. Bull. Jpn. Soc. Sci. Fish. 44 (3): 263-267. Mar. 1978. SFA 23(3)
[Dep. Fish., Fac. Agric., Kyoto Univ., Kyoto, Japan]

78-001598 Zeissig, J. E. MECHANISM OF SENSITIVITY CONTROL IN THE GOLDFISH RETINA. Ph.D. dissertation, Univ. Calif. (Berkeley) 144p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8):3578. Feb. 1977. SFA 23(3)

78-001599 Zeman, M. E.; Winningham, J. R.; Bulow, F. J. SEASONAL VARIATIONS IN LIVER AND MUSCLE RNA-DNA RATIOS OF THE BLUEGILL, /LEPOMIS MACROCHIRUS/. J. Tenn. Acad. Sci. 53 (2): 75. Apr. 1978. Abstract only. SFA 23(3)
[Tenn. Tech. Univ., Cookeville] RNA-DNA ratios of epaxial muscle and liver tissue samples from a natural population of bluegills (/Lepomis macrochirus/) were recorded from December 1976 through September 1977 to: (1) field test the RNA-DNA ratio technique of measuring short-term growth rate; (2) measure seasonal variations in relative growth rate as indicated by this technique; and (3) study the effects of various environmental and physiological factors on the RNA-DNA ratio and relative growth rate. This study will continue through November 1977 to complete the annual cycle, but results through September are reported here.

78-001600 Zolotnitskiy, A. P. AN ANALYSIS OF CHANGES OF GONADOTROPIC ACTIVITY IN THE HYPOPHYSIS OF THE BLACK SEA TURBOT (/SCOPHTHALMUS MAEOTICUS MAEOTICUS/) IN DIFFERENT STAGES OF THE REPRODUCTIVE CYCLE. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 496-500. 1977. SFA 23(3)
[AzCherNIRO, Kerch, USSR]

78-001601 Zubchenko, I. Z. BIOSORPTION BY MARINE FISHES OF METHIANINE AND UREA DISSOLVED IN WATER. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 336-341. 1977. SFA 23(3)
[Astrakhan Fish. Tech. Inst., USSR] The Black Sea scad and porgy have proved to be capable of biosorption, i.e. of absorbing by means of the integument of the body nutrient and toxic substances, methianine and urea, dissolved in water. The capacity of the kinetoblast and the phagocytoblast to biosorb organic substances dissolved in water has again been demonstrated in the porgy and the scad.

78-001602 Zubova, S. E. MITOTIC ACTIVITY OF THE GAMETES OF JUVENILE VOLGA STERLET (/ACIPENSER RUTHENUS/) FOLLOWING LOCAL IRRADIATION OF THE HYPOPHYSIS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 492-496. 1977. SFA 23(3)
[Dep. Ichthyol. Hydrobiol., Leningrad Univ., USSR]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION

78-001603 Angus, R. A. ORIGIN AND DISTRIBUTION OF MULTIPLE CLONES IN UNISEXUAL FISHES. Ph.D. dissertation, Univ. Conn. 75p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(5):3581. Feb. 1978. SFA 23(3)

78-001604 Black, A.; Howell, W. M. A DISTINCTIVE CHROMOSOMAL RACE OF THE CYPRINODONTID FISH, /FUNDULUS NOTATUS/, FROM THE UPPER TOMBIGBEE RIVER SYSTEM OF ALABAMA AND MISSISSIPPI. Copeia 1978 (2): 280-288. 5 May 1978. SFA 23(3)
[Dep. Biol., Samford Univ., Birmingham, AL 35209]

78-001605 Bodaly, R. A. EVOLUTIONARY DIVERGENCE BETWEEN CURRENTLY SYMPATRIC LAKE WHITEFISH, /COREGONUS CLUPEAFORMIS/, IN THE YUKON TERRITORY. Ph.D. dissertation, Univ. Manitoba 1977. From Diss. Abstr. Int. B Sci. Eng. 38(10), Apr. 1978. SFA 23(3)

78-001606 Brandes, W. F.; Harris, J. W.; Estes, R. D. ISOZYME VARIATION IN THE EASTERN BROOK TROUT, /SALVELINUS FONTINALIS/. J. Tenn. Acad. Sci. 53 (2): 74. Apr. 1978. Abstract only. SFA 23(3)
[Tenn. Tech. Univ., Cookeville] Eastern brook Trout were electrophoretically examined for 10 different proteins. Three enzymes, phosphoglucose isomerase (PGI), isocitrate dehydrogenase (IDH), and lactate dehydrogenase (LDH), extracted from liver and muscle tissues, were found to be polymorphic at one or more loci. Significant differences in allelic frequencies were found between the 13 allopatric populations sampled. A high degree of polymorphism was observed at the PGI-1 locus, where four alleles were identified. Populations from the Great Smoky Mountains National Park were fixed for loci observed to be polymorphic in other populations sampled. It is hypothesized that this lack of genetic variation is due to a high degree of inbreeding characteristic of the small brook trout populations present in the park.

78-001607 Buth, D. G.; Burr, B. M. ISOZYME VARIABILITY IN THE CYPRINID GENUS /CAMPOSTOMA/. Copeia 1978 (2): 298-311. 5 May 1978. SFA 23(3)
[Dep. Ecol. Ethol. Evol., Univ. Ill., Urbana 61801]

78-001608 Cook, P. C. KARYOTYPIC ANALYSIS OF THE GOBIID FISH GENUS /QUIETULA/ JORDAN AND EVERMANN. J. Fish Biol. 12 (2): 173-179. Feb. 1978. SFA 23(3)
[Aqua Finca de Camarones Aquaculture Farm Ltd., San Pedro Sula, Honduras] The karyotypes of the species of the gobiid fish genus /Quietula/, /Q. y-cauda/ (Jenkins & Evermann) and /Q. guaymasiae/ (Jenkins & Evermann), are reported for the first time. The karyotypes contained equal numbers of chromosomes (2/n/=42) but differed in chromosome morphology. /Quietula y-cauda/ has 42 acrocentric chromosomes. /Quietula guaymasiae/ has six metacentric, four

78-001608 CONTINUED
submetacentric, and 32 acrocentric chromosomes. It is suggested the karyotype of /Q. guaymasiae/ might have been derived from that of /Q. y-cauda/. In addition, from comparison of the species' karyotypes of the genera /Quietula/ and /Gillichthys/, it is possible the karyotype of /Q. y-cauda/ might have been derived from that of /Gillichthys mirabilis/.

78-001609 Dentry, W.; Lindsey, C. C. VERTEBRAL VARIATION IN ZEBRAFISH (/BRACHYDANIO RERIO/) RELATED TO THE PREFERTILIZATION TEMPERATURE HISTORY OF THEIR PARENTS. Can. J. Zool. 56 (2): 280-283. Feb. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada] Four breeding pairs of zebrafish were maintained at a low temperautre (21, 22, or 24°C), and their eggs placed immediately after laying at one of a variety of temperatures (ranging between 21 and 33°C), in which they were reared until vertebral count was determined. The same breeding pairs were at another time maintained at a high temperature (29 or 30°C), and eggs were similarly placed for rearing at one of a variety of temperatures. Vertebral counts were compared between sets of samples reared at the same temperature and originating from the same parents but laid during periods with different parental holding temperatures. In the three cases where differences between such pairs were statistically significant, vertebral counts were higher in the sample originating from the higher parental holding temperature. If meristic characters are in fact partly dependent on temperature history of the parents before fertilization, many published experimental and racial studies may need to be reinterpreted.

78-001610 Ferguson, A.; Himberg, K-J. M.; Svardson, G. SYSTEMATICS OF THE IRISH POLLAN (/COREGONUS POLLAN/ THOMPSON): AN ELECTROPHORETIC COMPARISON WITH OTHER HOLARCTIC COREGONINAE. J. Fish Biol. 12 (3): 221-233. Mar. 1978. SFA 23(3)
[Dep. Zool., The Queen's Univ., Belfast, Northern Ireland] Evidence is presented on the genetic relationships of 35 coregonine populations from Alaska, Britain, Ireland, Finland and Sweden. This evidence is derived from an electrophoretic analysis of 27 enzyme loci and additional 'general protein loci'. The Irish pollan /C. pollan/ and the Alaskan /C. autumnalis/ gave identical electrophoretic patterns for all proteins suggesting that they are conspecific and separated only since the last glaciation. /C. peled/, /C. albula/ and '/C. lavaretus/' complex gave unique patterns for a number of proteins. The /F/(n) /C. oxyrhynchus/ X /C. albula/ hybrids, from a lake where no other coregonines occur gave a unique pattern for the enzyme phosphoglucose isomerase but all other enzymes were electrophoretically identical to the /C. oxyrhynchus/ parent and the mean gill raker number was closer to this species than in the /F/(1) hybrid.

78-001611 Gorshkova, G. V.; Gorshkov, S. V. THE RESIDUAL SOCKEYE, /ONCORHYNCHUS NERKA/, FROM LAKE AZABACH'YE, KAMCHATKA. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 196-200. 1977. SFA 23(3)
[KoTINRO, USSR] It was demonstrated under experimental conditions that the homing instinct is not as clearly expressed in the dwarf males of the residual sockeye, /Oncorhynchus nerka/, as in the diadromous form. It was established that the dwarf males reach sexual maturity at an age of 2 years. The somatic tissues of the residual sockeye are distinguished by karyotype variability. The diploid set of 20 percent of the cells studied had 48 chromosomes. The eggs of diadromous females fertilized with the spermatozoa of dwarf males have a very high rate of survival by comparison with all other crossings

78-001611 CONTINUED
from diadromous spawners.

78-001612 Harris, J. W.; Brandes, W. F. THE GENETIC CONTROL OF ISOCITRATE DEHYDROGENASE ISOZYMES IN EASTERN BROOK TROUT, /SALVELINUS FONTINALIS/ (MITCHELL). J. Tenn. Acad. Sci. 53 (3): 74. Apr. 1978. Abstract only. SFA 23(3)
[Tenn. Tech. Univ., Cookeville] Liver samples were collected from 13 allopatric brook trout populations throughout the eastern United States and from Utah. The samples were extracted, subjected to starch gel electrophoresis, and the gels were stained for isocitrate dehydrogenase (IDH). The results indicate that IDH in brook trout is a dimmer coded for by two different loci. A total of four alleles were identified on the basis of the observed migration rates of the homodimers composed of the subunits which the various alleles specify. The data suggest that at least two of the alleles occur at both loci. The distribution of alleles at each locus was found to vary with the population.

78-001613 Heckman, J. R.; Braune, M. O. IMMUNOLOGICAL PROPERTIES OF LACTATE DEHYDROGENASE ISOZYMES IN TROUT. Trans. Am. Fish. Soc. 107 (2): 295-304. Mar. 1978. SFA 23(3)
[Biol. Dep., Elizabethtown Coll., Elizabethtown, PA 17022]

78-001614 Kinoshita, T. [POPULATION ANALYSIS OF THE JAPANESE ANCHOVY, /ENGRAULIS JAPONICA/, IN NORTHERN JAPAN BASED ON THE NUMBER OF GILL-RAKERS. II. COMPARISON OF LOCALITIES WITH REGARD TO THE NUMBER OF GILL-RAKERS.] Bull. Fac. Fish. Hokkaido Univ. 28 (3): 127-136. Aug. 1977. In Japanese with English summ. SFA 23(3)
[Lab. Biol. Fish Population, Fac Fish., Hokkaido Univ., Japan]

78-001615 Kinoshita, T. [POPULATION ANALYSIS OF THE JAPANESE ANCHOVY, /ENGRAULIS JAPONICA/, IN NORTHERN JAPAN BASED ON THE NUMBER OF GILL-RAKERS. I. SEASONAL AND ANNUAL DIFFERENCES IN THE RELATIONSHIP BETWEEN THE NUMBER OF GILL-RAKERS AND THE BODY LENGTH AMONG THE SAMPLES COLLECTED IN KAMIISO.] Bull. Fac. Fish. Hokkaido Univ. 28 (3): 118-126. Aug. 1977. In Japanese with English summ. SFA 23(3)
[Lab. Biol. Fish Population, Fac. Fish., Hokkaido Univ., Japan]

78-001616 Kornfield, I. L. EVIDENCE FOR RAPID SPECIATION IN AFRICAN CICHLID FISHES. Experientia (Basel) 34 (3): 335-336. 15 Mar. 1978. SFA 23(3)
[Dep. Zool., Univ. Me., Orono 04473] Extremely rapid divergence among 7 species of African cichlid fishes is suggested by high estimates of allozymic similarity. Significant differences in gene frequencies among sympatric populations support reproductive isolation of these taxa.

78-001617 Mackie, I. M.; Jones, B. W. THE USE OF ELECTROPHORESIS OF THE WATER-SOLUBLE (SARCOPLASMIC) PROTEINS OF FISH MUSCLE TO DIFFERENTIATE THE CLOSELY RELATED SPECIES OF HAKE (/MERLUCCIUS/ SP.). Comp. Biochem. Physiol. B Comp. Biochem. 59 (2): 95-98. 1978. SFA 23(3)
[Torry Res. Stn., 135 Abbey Rd., Aberdeen, Scotland]
Electrophoretic separation patterns of water-soluble proteins of five species of hake, /Merluccius merluccius/; /M. australis/; /M. productus/; /M. bilinearis/ and /M. angustimanus/, have been examined. The patterns were reproducible within each species and distinguishable

78-001617 CONTINUED
from one another. The frequency distribution of numbers of vertebrae and of gillrakers were obtained for the same fish. Only the electrophoretic patterns gave an unequivocal identification of the species.

78-001618 Menzel, B. W. THREE HYBRID COMBINATIONS OF MINNOWS (CYPRINIDAE) INVOLVING MEMBERS OF THE COMMON SHINER SPECIES COMPLEX (GENUS /NOTROPIS/, SUBGENUS /LUXILUS/). Am. Midl. Nat. 99 (1): 249-256. Jan. 1978. SFA 23(3)
[Dep. Anim. Ecol., Iowa State Univ., Ames 50011] Natural interspecific hybridization occurs frequently among members of the common shiner species complex because of their tendency to spawn over the nests of other cyprinids. The combinations /Campostoma anomalum/ X /Notropis cornutus/, /Notropis albeolus/ X /Notropis ardens/, and /Notropis lutipinnis/ X /Notropis zonistius/ are described. The hybrids are generally intermediate in morphological and pigmentation characteristics.

78-001619 Merritt, R. B.; Rogers, J. F.; Kurz, B. J. GENIC VARIABILITY IN THE LONGNOSE DACE, /RHINICHTHYS CATARACTAE/. Evolution 32 (1): 116-124. Mar. 1978. SFA 23(3)
[Dep. Biol. Sci., Smith Coll., Northampton, MA 01063]

78-001620 Mikhaylin, S. V. THE INTRASPECIFIC VARIABILITY OF THE FROSTFISH, /LEPIDOPUS CAUDATUS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 201-210. 1977. SFA 23(3)
VNIRO, Moscow, USSR]

78-001621 Nelson, J. S. HYBRIDIZATION BETWEEN /CATOSTOMUS COMMERSONI/ (WHITE SUCKER) AND /CATOSTOMUS MACROCHEILUS/ (LARGESCALE SUCKER) IN WILLISTON RESERVOIR, BRITISH COLUMBIA, WITH NOTES ON OTHER FISHES. Syesis 7: 187-194. 1974. SFA 23(3)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E1, Canada]

78-001622 Rachlin, J. W.; Beck, A. P.; O'Connor, J. M. KARYOTYPIC ANALYSIS OF THE HUDSON RIVER STRIPED BASS, /MORONE SAXATILIS/. Copeia 1978 (2): 343-345. 5 May 1978. SFA 23(3)
[C.U.N.Y. Inst. Mar. Atmos. Sci., City Coll., 138 St. and Convent Ave., New York, NY 10031]

78-001623 Savvaitova, K. A.; Maksimov, V. A.; Medvedeva, Ye. D. THE FROLIKHA CHAR, /SALVELINUS ALPINUS ERYTHRINUS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 181-195. 1977. SFA 23(3)
[Dep. Ichthyol., Moscow Univ., USSR] A detailed description of the morphology and ecology of the Lake Frolikha char, /Salvelinus alpinus erythrinus/, is given for the first time. The variability in the morphological, meristic and osteological characters within a population is examined. Information is given on its distribution and interpretation is made on its origin and affinities.

78-001624 Serobaba, I. I. DATA ON THE POPULATION STRUCTURE OF THE WALLEYE POLLACK, /THERAGRA CHALCOGRAMMA/, FROM THE BERING SEA. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 219-231. 1977. SFA 23(3)
[TINRO, Vladivostok, USSR] The population structure of the walleye pollack, /Theragra chalcogramma/, from the Bering Sea was studied on the basis of morphoecological characters. It is provisionally established that the Bering Sea population of the walleye pollock can be subdivided into four groupings, which intermingle on the margins of the zones they inhabit.

78-001625 Shirkova, A. P. HYBRID WHITEFISHES OF THE GENUS /COREGONUS/ FROM LAKE LADOGA. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 253-258. 1977. SFA 23(3)
[GosNIORKh, Leningrad, USSR] Data are given on hybrid specimens of the genus /Coregonus/ from Lake Ladoga collected in the 1960's. The hybrid is compared on the basis of a series of meristic and morphological characters with the native whitefishes: two lacustrine whitefishes, the "Ludoga whitefish", /Coregonus lavaretus ludoga/, and the "Ladoga whitefish", /C. lavaretus baeri/ n. /Ladogae/, the lake-river "Volkhov whitefish", /C. lavaretus baeri/, and the "Ladoga cisco", /Coregonus albula ladogensis/, as well as the Baikal omul, /C. autumnalis migratorius/, which were introduced into Lake Ladoga between 1964 and 1974. The hybrid apparently represents crosses between the Ladoga cisco and the Ludoga and Ladoga lake whitefishes.

78-001626 Smith, M. W. BIOCHEMICAL VARIATION IN THE MOSQUITOFISH. THE SAVANNAH RIVER DRAINAGE. Bull. S.C. Acad. Sci. 40: 36. 1978. Abstract only. SFA 23(3)
[Aiken High School, Aiken, SC]

78-001627 Takahashi, T. STUDIES ON THE ECOLOGY OF THE HERRING IN THE NORTHERN PART OF THE OKHOTSK SEA IN SUMMER--III. GEOGRAPHICAL VARIATIONS IN FORK LENGTH AND SCALE PATTERN IN 4 YEAR-OLD GROUP. Bull. Jpn. Soc. Sci. Fish. 44 (2): 105-116. Feb. 1978. SFA 23(3)
[Fac. Fish., Hokkaido Univ., Hakodate, Japan]

78-001628 Toledo F., S. A.; Ribeiro, A. F. DIRECTIONAL REDUCTION OF LACTATE DEHYDROGENASE ISOZYMES IN TELEOSTS. Evolution 32 (1): 212-216. Mar. 1978. SFA 23(3)
[Dep. Biol., Inst. Biocien., Univ. Sao Paulo, C.P. 11461-05421 Sao Paulo, Brazil]

78-001629 Urushido, T.; Takahashi, E.-I.; Taki, Y.; Kondo, N. A KARYOTYPE STUDY OF POLYPTERID FISHES, WITH NOTES ON THEIR PHYLETIC RELATIONSHIP. Proc. Jpn. Acad. Ser. B Phys. Biol. Sci. 53 (3): 95-98. June 1977. SFA 23(3)
[Res. Inst. Evol. Biol., Tokyo, Japan]

78-001630 Utter, F.; Folmar, L. PROTEIN SYSTEMS OF GRASS CARP: ALLELIC VARIANTS AND THEIR APPLICATION TO MANAGEMENT OF INTRODUCED POPULATIONS. Trans. Am. Fish. Soc. 107 (1): 129-134. Jan. 1978. SFA 23(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

78-001631 Viktorovskii, R. M.; Glubokovskii, M. K. MECHANISMS AND RATE OF SPECIATION IN CHAR OF THE GENUS /SALVELINUS/ (SALMONIDAE, PISCES). Dokl. Biol. Sci. (Engl. Transl. Dokl. Akad. Nauk SSSR Ser. Biol.) 235 (1-6): 272-275. July-Aug. 1977. SFA 23(3)
[Inst. Mar. Biol., Far-East. Sci. Cent., Acad. Sci. USSR, Vladivostok, USSR]

78-001632 Vrijenhoek, R. C.; Angus, R. A.; Schultz, R. J. VARIATION AND CLONAL STRUCTURE IN A UNISEXUAL FISH. Am. Nat. 112 (983): 41-55. Jan.-Feb. 1978. SFA 23(3)
[Dep. Zool., Rutgers Univ., New Brunswick, NJ 08903]

78-001633 Wheeler, A.; Easton, K. HYBRIDS OF CHUB AND ROACH (/LEUCISCUS CEPHALUS/ AND /RUTILUS RUTILUS/) IN ENGLISH RIVERS. J. Fish Biol. 12 (2): 167-171. Feb. 1978. SFA 23(3)
[Dep. Zool., British Mus. (Nat. Hist.), London SW7 5BD, England] The occurrence of hybrids between chub, /Leuciscus cephalus/, and roach, /Rutilus rutilus/, from three rivers in England is reported. The hybrids are described and illustrated, and means of identification are indicated. Chub X roach hybrids, like those between other leuciscine cyprinid species, can be positively identified by the number and form of the pharyngeal teeth.

78-001634 Wiseman, E. D.; Echelle, A. A.; Echelle, A. F. ELECTROPHORETIC EVIDENCE FOR SUBSPECIFIC DIFFERENTIATION AND INTERGRADATION IN /ETHEOSTOMA SPECTABILE/ (TELEOSTEI: PERCIDAE). Copeia 1978 (2): 320-327. 5 May 1978. SFA 23(3)
[Mus. Nat. Hist., Univ. Kans., Lawrence 66045]

78-001635 Yevsin, V. N. MORPHOLOGICAL CHARACTERISTICS AND VARIABILITY OF THE SUMMER SEA TROUT (/SALMO TRUTTA/) FROM THE PULONG'A AND MALAYA KUMZHEVAYA RIVERS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 350-356. 1977. SFA 23(3)
[Dep. Zool., Petrozavodsk Univ., USSR] Consideration is given to the morphological characteristics of the summer form of the sea trout, /Salmo trutta/, from the Pulong'a and Malaya Kumzhevaya rivers, and to the nature of its variation. It is demonstrated that the differences between the races of the sea trout are insignificant, whereas there are real differences in the summer sea trout from different waters with respect to a number of morphological characters; these differences are expressed quite clearly and testify to the existence of local stocks. The degree of the differences is slight and is dependent on the hydrologic characterisitcs of the waters and the distances for which the sea trout migrates.

78-001636 Yevsin, V. N. MORPHOLOGICAL CHARACTERISTICS AND VARIABILITY OF LOCAL STOCKS OF THE AUTUMN SEA TROUT (/SALMO TRUTTA/) OF THE RIVERS OF THE WHITE SEA BASIN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (6): 911-921. 1976. SFA 23(3)
[Dep. Zool., Petrozavodsk Univ., USSR] Consideration is given to the morphological characteristics of the autumn sea trout (/Salmo trutta/) spawning in various rivers of the White Sea Basin, and to the nature of variability of its characters. All stocks of the sea trout are shown to be similar and to differ only in the frequency with which various combinations of characters are encountered. However, the extent of the differences is slight and is dependent on the actual localities in which the sea trout reproduces and lives and on the hydrologic characteristics of its migratory paths.

78-001637 Zahner, E. J. A KARYOTYPE ANALYSIS OF FIFTEEN SPECIES OF THE FAMILY CICHLIDAE. Ph.D. dissertation, St. John's Univ. 128p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(7):3087. Jan. 1978. SFA 23(3)

BEHAVIOR

78-001638 Alley, D. W.; Li, H. W. SIGNIFICANCE OF MICROHABITAT SELECTION FOR FISHES IN A SIERRA FOOTHILL STREAM. Cal-Neva Wildl. Trans. 1977: 27-33. 1977. Copies available from The Wildlife Society, 4606 San Marino Drive, Davis, CA 95616. SFA 23(3)
[Univ. Calif., Davis] Underwater observations were employed to map, census, and measure water velocities and vertical spatial orientations of fishes at fish locations in Deer Creek, California. Several fish species were found to spatially segregate, including rainbow trout (/Salmo gairdneri/), Sacramento suckers (/Catostomas occidentalis/), Sacramento squawfish (/Ptychocheilus grandis/) and Sacramento hardhead minnows (/Mylopharodon conocephalus/). No behavioral interactions were observed between rainbow trout and two cyprinids, Sacramento squawfish and Sacramento hardhead minnows, in stream sections where all four were present. Trout densities fluctuated independent of other species densities from early summer to fall. Swimming endurance and metabolic rates were measured in the laboratory for hardhead minnows at various swimming velocities with the use of Brett-type respirometers. It was found that hardhead had lower scopes for activity than trout. Also, hardhead had lower metabolic rates than trout at different swimming velocities. These results imply that physiological differences between trout and hardhead can best explain their spatial segregation in the stream.

78-001639 Boehlert, G. W. PHYSIOLOGICAL AND MORPHOLOGICAL ADAPTATIONS IN THE SURFACE-TO-BENTHIC MIGRATION OF /SEBASTES DIPLOPROA/ (PISCES, SCORPAENIDAE). Ph.D. dissertation, Univ. Calif. (San Diego) 188p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(9): 4104. Mar. 1978. SFA 23(3)

78-001640 Caprio, J. OLFACTION AND TASTE IN THE CHANNEL CATFISH: AN ELECTROPHYSIOLOGICAL STUDY OF THE RESPONSES TO AMINO ACIDS AND DERIVATIVES. J. Comp. Physiol. A Sens. Neural Behav. Physiol. 123 (4): 357-371. 1978. SFA 23(3)
[Dep. Zool. Physiol., La. State Univ., Baton Rouge 70803]

78-001641 Coyne, J. A.; Sohn, J. J. INTERSPECIFIC BROOD CARE IN FISHES: RECIPROCAL ALTRUISM OR MISTAKEN IDENTITY? Am. Nat. 112 (984): 447-450. Mar.-Apr. 1978. SFA 23(3)
[Mus. Comp. Zool., Harvard Univ., Cambridge, MA 02138]

78-001642 Davitz, M. A.; McKaye, K. R. DISCRIMINATION BETWEEN HORIZONTALLY AND VERTICALLY POLARIZED LIGHT BY THE CICHLID FISH /PSEUDOTROPHEUS MACROPHTHALMUS/. Copeia 1978 (2): 333-334. 5 May 1978. SFA 23(3)
[Dep. Biol., Yale Univ., New Haven, CT 06520]

78-001643 Ebersole, J. P. ADAPTIVE TERRITORIAL STRATEGIES IN THE CORAL REEF FISH /EUPOMACENTRUS LEUCOSTICTUS/. Ph.D. dissertation, Univ. Calif. (Los Angeles) 88p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(6):2507. Dec. 1977. SFA 23(3)

78-001644 Farrell, A. P.; Randall, D. J. AIR-BREATHING MECHANICS IN TWO AMAZONIAN TELEOSTS, /ARAPAIMA GIGAS/ AND /HOPLERYTHRINUS UNITAENIATUS/. Can. J. Zool. 56 (4): 939-945. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-001645 Fivizzani, A. J.; Spieler, R. E. MODIFIED STAALAND DEVICE WITH AUTOMATIC RECORDING TECHNIQUES FOR DETERMINING SALINITY PREFERENCE IN FISHES. J. Fish. Res. Board Can. 35 (6): 910-912. June 1978. In English with French summ. SFA 23(3)
[Dep. Zool. Physiol., La. State Univ., Baton Rouge 70803]

78-001646 Glodek, G. S.; Carter, H. J. A NEW HELOGENEID CATFISH FROM EASTERN ECUADOR (PISCES, SILURIFORMES, HELOGENEIDAE). Fieldiana Zool. 72 (6): 75-82. 23 Feb. 1978. SFA 23(3)
[Div. Fish., Field Mus. Nat. Hist., Chicago, IL]

78-001647 Guest, W. C.; Lasswell, J. L. A NOTE ON COURTSHIP BEHAVIOR AND SOUND PRODUCTION OF RED DRUM. Copeia 1978 (2): 337-338. 5 May 1978. SFA 23(3)
[Heart of the Hills Res. Stn., Ingram, TX 78025] Our observation of red drum support previous conclusions that sounds are a part of the courtship behavior of some fishes. Drumming and nudging intensified prior to spawning and appeared to be major stimuli for the spawning act of red drum.--From author

78-001648 Hanson, D. L. HABITAT SELECTION AND SPATIAL INTERACTION IN ALLOPATRIC AND SYMPATRIC POPULATIONS OF CUTTHROAT AND STEELHEAD TROUT. Ph.D. dissertation, Univ. Idaho 76p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(3):1007. Sept. 1977. SFA 23(3)

We designed studies to assess and compare the distribution and density of allopatric populations of juvenile cutthroat and steelhead in large and small streams of central Idaho in relation to habitat parameters. Juvenile cutthroat and steelhead utilized deeper water of faster velocities in areas of larger substrate as they increased in size. Facing velocity explained 70 to 75 percent of the variability between increasing fish length and the seven physical variables tested for both species in stepwise regressions. Age 0 cutthroat were unable to establish territories in artificial stream channels already occupied by age 0 steelhead. Age 0 steelhead were able to establish territories in the same channels even though they were already occupied by cutthroat. Age 0 fish of both species used roughly the same habitat in allopatry in artificial stream channels. Cutthroat were not able to establish normal densities on the riffles when steelhead had prior residence. Cutthroat entered the substrate before steelhead as winter and colder water temperatures approached. We were unable to find any sympatric populations of juvenile cutthroat and steelhead in streams of central Idaho. This fact along with the data here presented suggests that interaction for habitat is occurring between juvenile cutthroat and steelhead in central Idaho. We speculate that this interaction results in interactive segregation in these streams.--From abstr.

78-001649 Hartmann, F. THE FIERCE AND FATHERLY SIAMESE FIGHTING FISH. Nat. Hist. 87 (5): 68-71. May 1978. SFA 23(3)

78-001650 Hirsch, P. J. CONDITIONING THE HEART RATE OF COHO SALMON (/ONCORHYNCHUS KISUTCH/) TO ODORS. Ph.D. dissertation, Univ. Wis. (Madison) 89p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(3):1084. Sept. 1977. SFA 23(3)

A series of experiments was performed to test whether heart rate changes of small coho salmon could be classically conditioned to odor stimuli. The fish were enclosed in acrylic tubes supplied with a constant water flow. Odor stimuli of morpholine or phenethyl alcohol were presented followed by a 3 to 5 volt shock. It was concluded that heart rate changes were conditioned to chemical stimulation of the olfactory system.--From abstr.

78-001651 Hopkins, C. D.; Heiligenberg, W. F. EVOLUTIONARY DESIGNS FOR ELECTRIC SIGNALS AND ELECTRORECEPTORS IN GYMNOTOID FISHES OF SURINAM. Behav. Ecol. Sociobiol. 3 (2): 113-134. 3 Apr. 1978. SFA 23(3)

[Dep. Ecol. Behav. Biol., Univ. Minn., Minneapolis 55455

78-001652 Kawanabe, H. RELIC SOCIAL STRUCTURE HYPOTHESIS ON THE TERRITORIALITY OF AYU, /PLECOGLOSSUS ALTIVELIS/ (PISCES: OSMERIDAE). Proc. Jpn. Acad. Ser. B Phys. Biol. Sci. 53 (2): 74-77. May 1977. SFA 23(3)

[Dep. Zool, Fac. Sci., Kyoto Univ., Japan]

78-001653 Lanzing, W. J. R. REASSESSMENT OF CHROMATOPHORE PATTERN REGULATION IN TWO SPECIES OF FLATFISH (/SCOPHTHALMUS MAXIMUS/; /PLEURONECTES PLATESSA/). Neth. J. Sea Res. 11 (2): 213-222. Nov. 1977. SFA 23(3)
[Sch. Biol. Sci., Univ. Sydney, Australia]

78-001654 Larson, R. J. HABITAT SELECTION AND TERRITORIAL COMPETITION AS THE CAUSES OF BATHYMETRIC SEGREGATION OF SIBLING ROCKFISHES (/SEBASTES/). Ph.D. dissertation, Univ. Calif. (Santa Barbara) 180p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(11):5168 May 1978. SFA 23(3)

78-001655 Luckhurst, B. E.; Luckhurst, K. NOCTURNAL OBSERVATIONS OF CORAL REEF FISHES ALONG DEPTH GRADIENTS. Can. J. Zool. 56 (2): 155-158. Feb. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada] The foraging heights, at night, of some apogonid and holocentrid fishes are given. The noctural density of two species of planktivore (/Chromis multilineatus/ and /Clepticus parrai/) along three depth (10-40 m) transects is figured. In the former species, density rapidly declined with depth. The use of the same shelter sites, at night, by individuals of the latter species is illustrated. The noctural abundance of three apogonid species is shown to be markedly higher than that observed during the day. The consistent use of two sponges for shelter is demonstrated.

78-001656 Matthews, W. J. INFLUENCE OF PHYSICO-CHEMICAL FACTORS ON HABITAT SELECTION BY RED SHINERS, /NOTROPIS LUTRENSIS/ (PISCES: CYPRINIDAE). Ph.D. dissertation, Univ. Okla. 106p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(9):4042. Mar. 1978. SFA 23(3)
Field studies were combined with single and multifactor laboratory preference tests to determine the relative influence of several physico-chemical factors on red shiner habitat selection. Temperature, pH, and total dissolved solids were the water quality factors that had the greatest potential influence, while dissolved oxygen and turbidity were of limited importance in habitat selection by the species. Red shiners avoided temperature extremes during winter and summer in both the field and the laboratory. Values of pH encountered in the field ranged from 7.5 to 9.6, of which the shiners avoided highly alkaline conditions. Their response to pH was strong in the laboratory, usually characterized by preference for pH of 7.1 to 7.4, and an avoidance of values below neutral. The response of the species to total dissolved solids was strong in the laboratory, and they apparently responded to this factor in the field when the range exceeded 500 ppm. Current speed was the physical factor to which red shiners responded most consistently, followed by depth. In all study periods, they preferred water deeper than 20 cm, with neglegible flow. Shelter, shade, and substrate exerted less influence on their selection of habitat. The shiners avoided unsheltered locations and clean, unstable sand substrate. Their response to shade could be explained by their thermal preferences.

78-001657 Muir, J.; Rigley, L. DAILY LOCOMOTOR ACTIVITY PATTERN OF THE BROWN BULLHEAD, /ICTALURUS NEBULOSUS/ (LESUER). Proc. Pa. Acad. Sci. 51 (2): 115-116. 1977. SFA 23(3)

[Wilkes Coll., Wilkes-Barre, PA 18703] The brown bullhead /Ictalurus nebulosus/ was investigated in the laboratory to determine if its daily locomotor pattern corresponded to changes in natural lighting. Fish tested in various light regimes were found to be crepuscular and nocturnal.

78-001658 Nelissen, M. H. J. SOUND PRODUCTION BY SOME TANGANYIKAN CICHLID FISHES AND A HYPOTHESIS FOR THE EVOLUTION OF THEIR COMMUNICATION MECHANISMS. Behaviour 64 (1-2): 137-147. 1978. In English with French summ. SFA 23(3)

[Lab. Algamene Dierkunde, Rijksuniv. Cent. Antwerpen, Belgium] Sound production is studied in /Haplochromis burtoni/, /Simochromis diagramma/, /S. babaulti/, /Tropheus moorii/, /T. brichardi/ and /T. duboisi/ (Pisces, Cichlidae). The recorded sounds are analysed and visualized as sonograms. As far as communication is concerned, /Tropheus/ is specialized in sound production while /Simochromis/ is specialized in colour patterns. These ways of evolution from an /Haplochromis/-like ancestor could be correlated with the fact that /Tropheus/ became night-active, and /Simochromis/ day-active.--Summ.

78-001659 Pfeiffer, W.; Riegelbauer G. THE EFFECT OF THE ALARM SUBSTANCE ON THE CENTRAL NERVOUS EXCITATION OF THE BLACK TETRA /GYMNOCORYMBUS TERNETZI/ (CHARACIDAE, OSTARIOPHYSI, PISCES) INDICATED BY DORSAL LIGHT RESPONSE. J. Comp. Physiol. A Sens. Neural Behav. Physiol. 123 (3): 281-288. 1978. SFA 23(3)

[Inst. Biol., Univ. Tubingen, Auf der Morgenstelle 28, D-7400 Tubingen, West Germany]

78-001660 Phillips, A. C.; Barraclough, W. E. ON THE EARLY LIFE HISTORY OF THE LINGCOD (/OPHIODON ELONGATUS/). Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 756. iv + 35p. Dec. 1977. In English with French summ. SFA 23(3)

[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Newly hatched 7 mm larvae of the lingcod (/Ophiodon elongatus/) are pelagic and appear, by early March, in the surface waters of the Strait of Georgia, British Columbia, where they are dispersed by currents. As the larvae grow, they move progressively inshore and, in late May, reach high concentrations in certain shallow areas. Shortly thereafter, at a length of about 80 mm, they disappear from the surface waters and become demersal. Food at first consists of small copepods, their eggs and naupliar stages; shifting to larger copepods, decapod, and fish larvae as the lingcod grows in size. an abrupt dietary shift from zooplankton to juvenile herring immediately precedes commencement of demersal life. Juvenile lingcod marked with fluorescent grit and held in aquaria retained their marks for 3 mo. They grew rapidly and readily accepted live or frozen juvenile herring, salmon, and sandlance as food.

78-001661 Reynolds, W. W.; Casterlin, M. E. BEHAVIORAL THERMOREGULATION AND DIEL ACTIVITY IN WHITE SUCKER (/CATOSTOMUS COMMERSONI/). Comp. Biochem. Physiol. A Comp. Physicl. 59 (3): 261-262. 1978. SFA 23(3)

[Biol. Dep., Pa. State Univ., Wilkes-Barre, PA] In an electronic thermoregulatory shuttlebox, eleven white suckers (/Catostomus commersoni/) were tested individually for 3-day periods, controlling water temperatures by their movements between chambers monitored by photocells. Eighty-nine per cent of locomotor activity (light beam interruptions) occurred during darkness under an L:D 12:12 photoperiod. Preferred temperatures ranged from 22.8 to 26.1°C, and were slightly higher during the day (mean = 24.2°C, mode = 25°C) than at night (mean and mode = 24.0°C).

78-001662 Reynolds, W. W.; Casterlin, M. E.; Millington, S. T. CIRCADIAN RHYTHM OF PREFERRED TEMPERATURE IN THE BOWFIN /AMIA CALVA/, A PRIMITIVE HOLOSTEAN FISH. Comp. Biochem. Physiol. A Comp. Physiol. 60 (1): 107-109. 1978. SFA 23(3)

[Biol. Dep., Pa. State Univ., Wilkes-Barre 18708] In an electronic thermoregulatory shuttlebox, the bowfin exhibits an endogenous circadian rhythm of preferred temperature, with a peak of 32.0°C during the day and a minimum of 28.8°C at night. The 24-hr mean preferred temperature (final preferendum) is 30.5°C; the diurnal mean is 31.3°C and the nocturnal mean is 29.6°C. There is no clear rhythm of locomotor activity evident in this species; diurnal and nocturnal activity do not significantly differ as measured by two independent methods.

78-001663 Reynolds, W. W.; Casterlin, M. E.; Matthey, J. K.; Millington, S. T.; Ostrowski, A. C. DIEL PATTERNS OF PREFERRED TEMPERATURE AND LOCOMOTOR ACTIVITY IN THE GOLDFISH /CARASSIUS AURATUS/. Comp. Biochem. Physiol. A Comp. Physiol. 59 (2): 225-227. 1978. SFA 23(3)

[Biol. Dep., Pa. State Univ., Wilkes-Barre] Goldfish thermoregulating in an electronic shuttlebox device exhibited a bimodal (crepuscular) rhythm of locomotor activity (peaks at the beginning and end of the dark period) and a unimodal (nocturnal) peak of preferred temperature during the latter half of the dark period. There was no direct relationship between temperature and activity level within the preferred-temperature range of 26-30°C. The preferred temperature peak (29.7°C) occurred at a time ("pre-dawn") most conducive to increase in body weight and gonosomatic index in goldfish subjected to an exogenously cycled thermal regime.

78-001664 Reynolds, W. W. THE FINAL THERMAL PREFERENDUM OF FISHES: SHUTTLING BEHAVIOR AND ACCLIMATION OVERSHOOT. Hydrobiologia 57 (2): 123-124. 21 Jan. 1978. SFA 23(3)

[Biol. Dep., Pa. State Univ., Wilkes-Barre 18708] The concept of final preferendum is reexamined in light of data concerning acclimation in a cyclic thermal regime. Because of 'shuttling behavior' to temperatures above and below the mean preferendum, and because of faster acclimation 'upward' than 'downward', which result in acclimation to a temperature exceeding the mean of the cycle, a fish may finally gravitate to a preferendum which does not equal acclimation temperature. It is suggested that a distinction be made between the 'crossoverpoint' preferendum, where preference and acclimation are equal, and the 'ultimate' preferendum to which a fish will ultimately gravitate.

78-001665 Reynolds, W. W.; Casterlin, M. E. ONTOGENETIC CHANGE IN PREFERRED TEMPERATURE AND DIEL ACTIVITY OF THE YELLOW BULLHEAD, /ICTALURUS NATALIS/. Comp. Biochem. Physiol. A Comp. Physiol. 59 (4): 409-411. 1978. SFA 23(3)

[Biol. Dep., Pa. State Univ., Wilkes-Barre 18708] In a electronic thermoregulatory shuttlebox, the (24 hr) mean preferred temperature of 12 adult yellow bullheads was 27.6°C, while that of 12 juveniles was 28.8°C; the mean for all ages was 28.4°C (final preferenda). Mean preferred temperatures differed by no more than 0.4°C between photophase (day) and scotophase (night) of the light cycle. Adult bullheads were nocturnal (most active during the central 8 hr of the scotophase), while juveniles were more crepuscular (most active during the two 4-hr "dusk" periods centered about the light-dark transitions)

78-001666 Richards, F. P.; Ibara, R. M. THE PREFERRED TEMPERATURES OF THE BROWN BULLHEAD, /ICTALUPUS NEBULOSUS/, WITH REFERENCE TO ITS ORIENTATION TO THE DISCHARGE CANAL OF A NUCLEAR POWER PLANT. Trans. Am. Fish. Soc. 107 (2): 288-294. Mar. 1978. SFA 23(3)

[Ecological Analysts, Inc., 275 Brood Hollow Rd., Melville, NY 11746]

78-001667 Ross, J.; Powles, P. M.; Berrill, M. THERMAL SELECTION AND RELATED BEHAVIOR IN LARVAL YELLOW PERCH (/PERCA FLAVESCENS/). Can. Field-Nat. 91 (4): 406-410. Oct.-Dec. 1977. SFA 23(3)

[Dep. Biol., Trent Univ., Peterborough, ON K9J 7B8, Canada] Thermal preferenda and behavior of larval yellow perch (/Perca flavescens/) were observed at successive developmental stages in a vertical thermal gradient. Newly hatched larvae acclimated to 20, 23, and 25°C selected 24.3 ± 3.9, 24.2 ± 4.5, and 21.7 ± 2.4°C respectively. Preferenda did not differ significantly with development stage to day 24. Prior to swim bladder inflation, equilibrium required a combination of sinking and locomotory activity. After inflation (7-10 days from hatching at 23°C), vertical position was regulated by bladder control and blundering into warm water was reduced. This maladaptive behavior in response to elevated temperatures (rising to very warm surface layers) is described and discussed.

78-001668 Rowland, W. J.; Rowlands, R. D. FLANK PATCH PIGMENTATION AND BEHAVIOR OF THE JEWEL FISH, /HEMICHROMIS BIMACULATUS/. Behav. Biol. 23 (1): 87-94. May 1978. SFA 23(3)

[Dep. Biol., Indiana Univ., Bloomington 47401] The behavior and flank patch pigmentation of jewel fish, /Hemichromis bimaculatus/, were recorded during dummy presentations. Adult males exhibited a capacity for rapid changes in intensity of such pigmentation. The intensity of pigmentation was categorized into one of three conditions: black, gray, and light. Assumption of the light patch condition was associated with a courtship response to the dummy and assumption of the black patch condition with an aggressive response. It is suggested that the condition of the flank patch could be used as a general indicator of a fish's internal state and thus might function in intraspecific communication.

78-001669 Rowland, W. J. SOUND PRODUCTION AND ASSOCIATED BEHAVIOR IN THE JEWEL FISH, /HEMICHROMIS BIMACULATUS/. Behaviour 64 (1-2): 125-136. 1978. In English with German summ. SFA 23(3)
[Dep. Biol., Indiana Univ., Bloomington] Sound production and associated behavior of the jewel cichlid, /Hemichromis bimaculatus/ was investigated by presenting the subjects with dummies. Thump sounds are associated with a behavior called nodding and probably represent a relatively high level of aggression. Purring is closely associated with lateral display and tailbeating and occurs during the early stages of courtship and attack. The third sound consists of a series of low frequency pulses that are synchronized with the movement of courtship quivering. Individuals direct more behavior toward a dummy emitting thumps and purrs than to a silent one or to one producing pulses of white noise. This indicates that /H. bimaculatus/ uses sound, either alone or in conjunction with other behaviors, for intraspecific communications.--Summ.

78-001670 Scholz, A. T.; Cooper, J. C.; Horrall, R. M.; Hasler, A. D. HOMING OF MORPHOLINE-IMPRINTED BROWN TROUT, /SALMO TRUTTA/. NOAA Fish. Bull. 76 (1): 293-295. Jan. 1978. SFA 23(3)
[Lab. Limnol., Univ. Wis., Madison 53706]

78-001671 Shaw, E. SCHOOLING FISHES. Am. Sci. 66 (2): 166-175. Mar.-Apr. 1978. SFA 23(3)
[Dep. Biol. Sci., Stanford Univ., Stanford, CA 94305]

78-001672 Stauffer, T. M. BEHAVIOR OF AGE-0 AND AGE-I LAKE TROUT UNDER LABORATORY CONDITIONS. Mich. Dep. Nat. Resour. Fish. Res. Rep. No. 1857. 14p. 28 Feb. 1978. SFA 23(3)
[Mich. Dep. Nat. Resour., East Lansing] Habitat preferences and early migration of young lake trout (/Salvelinus namaycush/), as well as methods of catching them are not clearly understood. Such information is necessary to assess natural reproduction quickly and efficiently. My experiments with hatchery-reared trout at Marquette Hatchery add to the knowledge of habitat preferences, early migration and sampling methods. Observations of substrate selection and spatial distribution of 546 late sac fry, 16 feeding fry and 6-10 trout (age-0, 60-90 mm TL) were made at different times in an indoor tank. Zooplankton provided a limited supply of food for fry, but no food was provided for the larger trout. Early migration was assessed by placing eggs or feeding fry in central compartments of four raceways, and observing subsequent migration to adjacent shallower or deeper areas. The efficiency of Mason jars with inverted funnels and plastic minnow traps as sampling tools was tested in a tank containing 13 feeding fry. Another efficiency test of minnow traps was conducted in an outdoor hatchery pond during January-April. Six groups of age-I lake trout were placed in the pond at various times during the experiment. My observations showed that sac fry, feeding fry, and older age-0 trout were benthic in nature. Sac fry and feeding fry did not demonstrate a bottom type preference when given a choice of sand, gravel and rubble although older age-0 trout evidenced a preference for rubble bottom. Sac fry dispersed gradually at random from the location where they had been placed as ready-to-hatch eggs. Dispersal occurred from hatching to about 2 weeks after swim-up, a 12-week period. Within this period, fry showed no preference for deep or shallow water but older fry that had been feeding for a month or so showed a preference for deep water. Minnow traps showed promise as a method of catching small lake trout.

78-001673 Symons, P. E. K. LEAPING BEHAVIOR OF JUVENILE COHO (/ONCORHYNCHUS KISUTCH/) AND ATLANTIC SALMON (/SALMO SALAR/). J. Fish. Res. Board Can. 35 (6): 907-909. June 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

78-001674 Takemura, A.; Takita, T.; Mizue, K. STUDIES ON THE UNDERWATER SOUND--VII. UNDERWATER CALLS OF THE JAPANESE MARINE DRUM FISHES (SCIAENIDAE). Bull. Jpn. Soc. Sci. Fish. 44 (2): 121-125. Feb. 1978. SFA 23(3)
[Fac. Fish., Nagasaki Univ., Bunkyo-machi, Nagasaki, 852, Japan] The underwater calls of the Japanese marine drum fishes, Koichi (/Nibea albiflora/) and Shiroguchi (/Argyrosomus argentatus/), living in Ariake Sound have been studied. The underwater calls of these fishes are a grating sound consisting of a train of pulses. The call was higher in Koichi than in Shiroguchi and in males than in females. The calls are produced by cramping the drumming muscle against the body axis and by rubbing this muscle with the peritoreum. The call produced is resonated and amplified by the swim-bladder connected with the drumming muscle before it is emitted into the sea water. These marine drum fishes live in Ariake Sound throughout the year. The chorus could be heard from early May to the middle of September and the sound-production was connected with the reproduction of these species. The most noisy period was, however, July and August following the spawning peak. These fishes began to emit their calls before sunset and the sound level of the chorus attained its maximum after sunset. No calls were heard from midnight to noon. The duration of the chorus attained its maximum in August and gradually decreased again thereafter. It was in no way related to tide.

78-001675 Thresher, R. E. TERRITORIALITY AND AGGRESSION IN THE THREESPOT DAMSELFISH, /EUPOMACENTRUS PLANIFRONS/ (PISCES; POMACENTRIDAE): AN EXPERIMENTAL STUDY OF CAUSATION. Ph.D. dissertation, Univ. Miami 88p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(7):3085. Jan. 1978. SFA 23(3)

78-001676 Trivedi, Y. A STUDY OF THE ASSOCIATIVE BEHAVIOUR OF THE FISH /AMPHIPRION POLYMNUS/ (LINN.) AND SEA ANEMONE /STOICHACTIS GIGANTEUM/ (FORSK.). J. Bombay Nat. Hist. Soc. 73 (3): 444-447. Dec. 1976. SFA 23(3)
[Prawn Cult. Unit, 960 Sameja Niwas, Dawn Area, Bhavnagar, Gujarat, India]

78-001677 Vail, K. F. REACTION TO COLOR PLACEMENT IN /BETTA SPLENDENS/. J. Tenn. Acad. Sci. 53 (2): 75. Apr. 1978. Abstract only. SFA 23(3)
[Univ. Tenn., Chattanooga] Effects of color placement diagrams upon the display mechanisms of /Betta splendens/ were determined. The presentation of scale diagrams with various anatomical color combinations to individual /Betta/ in a series of trials provided data. The diagram without coloration, with only natural gill coloration and with gill and tail coloration elicited no response. Several combinations of color and placement caused slight aggressive display, while the diagrams with full natural coloration, with dorsal fins and spread tail coloration and with dorsal fin coloration alone provided the greatest degree of aggressive display recorded.

78-001678 Venables, B. J.; Fitzpatrick, L. D.; Pearson, W. D. LABORATORY MEASUREMENT OF PREFERRED BODY TEMPERATURE OF ADULT LARGEMOUTH BASS (/MICROPTERUS SALMOIDES/). Hydrobiologia 58 (1): 33-36. 14 Mar. 1978. SFA 23(3)
[Sch. Biol. Sci., Okla. State Univ., Stillwater 74074] Preferred deep body temperatures of adult bass were determined in the laboratory using a horizontal temperature gradient and telemetry. The method used allowed continuous monitoring of body temperatures of adult bass in the gradient. The preferred temperature of adults (range = 27-32°C) was similar to preferenda reported earlier for sub-adults.

78-001679 Waxman, H. M.; McCleave, J. D. AUTO-SHAPING IN THE ARCHER FISH (/TOXOTES CHATAREUS/). Behav. Biol. 22 (4): 541-544. Apr. 1978. SFA 23(3)
[Dep. Psychol., Bryn Mawr Coll., Bryn Mawr, PA 19010] In nature, archer fish obtain food by squirting water at insects perched above the surface. In this experiment, it was found that this squirt response could come under the control of a previously neutral visual cue signaling the availability of an insect in an auto-shaping procedure. When the onset of a red light above the water signaled the availablity of a fruit fly each of three archer fish began to squirt at the light after 43 to 52 light-insect pairings, even though a response was not necessary for the insect to be delivered. No responses were made by two other fish given 160 random presentations of light and fruit fly.

78-001680 Yonemori, T. [MEASUREMENTS ON SWIMMING POWER OF FISH--I. PURPOSE AND METHOD OF MEASUREMENT.] Bull. Jpn. Soc. Sci. Fish. 44 (2): 127-130. Feb. 1978. In Japanese with English summ. SFA 23(3)
[Lab. Fish. Technol., Fac. Fish., Kagoshima Univ., Kagoshima, Japan]

LIFE HISTORIES-GENERAL WORKS

78-001681 Abdullayev, M. A.; Khakberdiyev, B.; Urchinov, D. BIOLOGY OF THE EUROPEAN CATFISH (/SILURUS GLANIS/) FROM LAKES IN THE LOWER REACHES OF THE ZARAFSHAN RIVER AND KHOREZM PROVINCE. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 487-491. 1977. SFA 23(3)
[Bukhara Pedagog. Inst., USSR]

78-001682 Babayev, N. S. THE BIOLOGICAL CHARACTERISTICS OF THE ARAL ASP, /ASPIUS ASPIUS IBLIOIDES/, FROM THE LOWER REACHES OF THE SYR DARYA. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 232-239. 1977. SFA 23(3)
[Aral Dep., Kazakh Fish. Res. Inst., USSR] The length of females and males of the Aral asp entering the Syr Darya River in October-November 1968-1970, varied on average from 50.3 to 52.7 cm. The mean weight of females varied from 2.4 to 2.7 kg, of males from 2.1 to 2.4 kg. The condition factor of females and males varied from 1.47 (1968) to 1.52 (1969-1970). Fish of 4+ and 5+ were the predominate age groups in catches in 1968-1970. Asp spawners begin to arrive in the Syr Darya at a water temperature of 8-10° at the end of September. The mass migration is noted at the end of October/second half of November at a water temperature of 2.0-0.4°. The asp spawning begins at the end of March/beginning of April at a water temperature of 7° and ends in the first or second half of April at a temperature of 12-13°. The incubation period lasts 11-15 days at a water temperatrue of 7-16°.

78-001682 CONTINUED
The absolute individual fecundity of the Aral asp is in direct relation to the weight and size of the fish (correlation coefficient +0.74 and +0.68 respectively).--Concl.

78-001683 Badsha, K. S.; Sainsbury, M. ASPECTS OF THE BIOLOGY AND HEAVY METAL ACCUMULATION OF /CILIATA MUSTELA/. J. Fish Biol. 12 (3): 213-220. Mar. 1978. SFA 23(3)
[Sch. Biol. Sci., Univ. Bath, Claverton Down, Bath BA2 7AY, England] The feeding habits, rates of growth, fecundity and other aspects of the general biology of five-bearded rockling from the Severn Estuary and the Bristol Channel are reviewed for the period 1974/76. Additionally the changes in heavy metal accumulation during this time have been measured and an attempt has been made to relate them to the diet of the fish.

78-001684 Baird, D. AGE, GROWTH AND ASPECTS OF REPRODUCTION OF THE MACKEREL, /SCOMBER JAPONICUS/ IN SOUTH AFRICAN WATERS (PISCES: SCOMBRIDAE). Zool. Afr. 12 (2): 347-362. 1977. SFA 23(3)
[Dep. Zool., Univ. Port Elizabeth, South Africa] The age and growth of the mackerel were determined from 1742 otoliths collected from commercial catches. The time of annulus formation was established from otolith edge examinations. Two zones, one opaque and one hyaline, are laid down during a year. The distance of each annulus from the nucleus of the otolith was measured. Mean measurements were sustituted in a linear regression equation which describes the relationship between otolith radius and fish length to obtain back-calculated length at age values. Growth in length and in mass are expressed by the von Bertalanffy growth equation. Length and age at first maturity were established by macroscopic examination of mackerel gonads. All mackerel were found to mature during their fourth year of life, at 42 cm standard body length. Spawning takes place during the period June to September.

78-001685 Berrien, P.; Finan, D. BIOLOGICAL AND FISHERIES DATA ON SPANISH MACKEREL, /SCOMBEROMORUS MACULATUS/ (MITCHILL). U.S. Dep. Commer. Natl. Mar. Fish. Serv. Sandy Hook Lab. Tech. Ser. Rep. No. 9. v + 52p. Nov. 1977. SFA 23(3)
[NMFS, Sandy Hook Lab., Highlands, NJ]

78-001686 Berrien, P.; Finan, D. BIOLOGICAL AND FISHERIES DATA ON KING MACKEREL, /SCOMBEROMORUS CAVALLA/ (CUVIER). U.S. Dep. Commer. Natl. Mar. Fish. Serv. Sandy Hook Lab. Tech. Ser. Rep. No. 8. v + 40p. Nov. 1977. SFA 23(3)
[NMFS, Sandy Hook Lab., Highlands, NJ]

78-001687 Copes, F. C. ECOLOGY OF THE CREEK CHUB. Univ. Wis. Stevens Point Mus. Nat. Hist. Rep. Fauna Flora Wis. No. 12. 21p. 30 Apr. 1978. SFA 23(3)
[Univ. Wis., Stevens Point]

78-001688 Druzhinin, A. D. THE PACIFIC CORNETFISH (/FISTULARIA PETIMBA/) (FAMILY FISTULARIIDAE) FROM THE GULF OF ADEN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 476-479. 1977. SFA 23(3)
[VNIRO, Moscow, USSR] The Pacific cornetfish, which lives at depths of less than 100 m, reaches a length of 128.5 cm and a weight of 1450 g. Females are larger than males. The length of the caudal filament ranges between 6 and 22 cm and is 7.2-47.4 pecent of body length excluding the filament. Only the right gonad was developed in the fish investigated. The spawning period lasts at least 7 months. The Pacific cornetfish is a predator that feeds mainly on fishes, but also on cephalopods, shrimps, hermit crabs and other crustaceans.--Concl.

78-001689 Druzhinin, A. D.; Busakhin, S. V. SOME DATA ON /GYMNOCRANIUS GRISEUS/ FROM THE NORTHWESTERN INDIAN OCEAN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 148-150. 1977. SFA 23(3)
[VNIRO, Moscow, USSR]

78-001690 Erickson, J. E. THE LIFE HISTORY OF THE BANDED DARTER, /ETHEOSTOMA ZONALE ZONALE/ (COPE), IN THE CANNON RIVER, MINNESOTA. Ph.D. dissertation, Univ. Minn. 149p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(6):2569. Dec. 1977. SFA 23(3)
The preferred habitat of /E. z. zonale/ in Minnesota was characterized as a stream at least 10 meters wide, containing gravel-rubble riffles with a depth of 30 centimeters and a moderate to rapid current. While rapid growth in this species occurred between June and September, no statistically significant growth occurred between October and May. The mean standard length attained by males and females after one growing season was not significantly different; but, after subsequent growing seasons, males were significantly larger than females of the same age. Males and females achieved 64.4 percent and 68.5 percent, respectively, of their total growth after one growing season. Although no significant departure from a 1:1 sex ratio was observed in young-of-the-year, all other age-groups had significantly more females than males. The oldest and largest male and female collected were 41 and 48 months of age and 50.4 and 47.7 millimeters in standard length, respectively. The potential spawning period of banded darters in Minnesota encompassed a period from the first week in June to the last week in July. The majority of yearling males and females were mature and capable of spawning, but whether there were successful spawners is not known. The total number of mature ova in 24 females of all sizes and age-groups ranged from 80 to 262. More than 98 percent of the food items ingested by /E. z. zonale/ were found to be Diptera, Ephemeroptera, and Trichoptera larvae.--From abstr.

78-001691 Etchevers, S. L. CONTRIBUTION TO THE BIOLOGY OF THE SEA CATFISH, /ARIUS SPIXII/ (AGASSIZ) (PISCES-ARIIDAE), SOUTH OF MARGARITA ISLAND, VENEZUELA. Bull. Mar. Sci. 28 (2): 381-385. Apr. 1978. SFA 23(3)
[4119 107th Place, N.E., Kirkland, WA 98033] A total of 2,297 specimens of /Arius spixii/ were sampled with different fishing gears between April 1972 and March 1973. The length-weight relationship for both sexes combined was $Wt = 1.2648 \times 10^{-5}$ (SL) to the 3.0414, where Wt is the weight in grams and SL is the standard length in mm. /A. spixii/ was found to spawn once a year between July and October. One batch of eggs was found in the gonads. The fecundity-length relationship was Fec = -28.9 + 0.2778 (SL) and the fecundity-weight relationship was Fec = 5.97 + 0.133 Wt. The von Bertalanffy growth equation estimated for the species was (SL)(t) = 298.6 [1 - e to the -0.34429(t + 0.608)].

78-001692 Etchevers, S. L. CONTRIBUTION TO THE BIOLOGY OF /DIAPTERUS RHOMBEUS/ (CUVIER) (PISCES-GERRIDAE), SOUTH OF MARGARITA ISLAND, VENEZUELA. Bull. Mar. Sci. 28 (2): 385-389. Apr. 1978. SFA 23(3)

[4119 107th Place, N.E., Kirkland, WA 98033] A total of 2,164 specimens of /Diapterus rhombeus/ were sampled with four different fishing gears from April 1972 to March 1973. The length-weight relationship for both sexes combined was Wt = 1.7655 + 10^{-5} (SL)to the 3.1612, where Wt is the weight in grams and SL the standard length in mm. /D. rhombeus/ spawned throughout the year with two spawning peaks. One was between April and June and a second was between September and November. The size at first maturity was 115 mm for males and 125 mm for females. The von Bertalanffy growth equation estimated for the species was SL = 204 [1 - e to the -0.666(t - 0.0033)].

78-001693 Freeman, B. L.; Turner, S. C. BIOLOGICAL AND FISHERIES DATA ON TILEFISH, /LOPHOLATILUS CHAMAELEONTICEPS/ GOODE AND BEAN. U.S. Dep. Commer. Natl. Mar. Fish. Serv. Sandy Hook Lab. Tech. Ser. Rep. No. 5. v + 41p. May 1977. SFA 23(3)

[NMFS, Sandy Hook Lab., Highlands, NJ]

78-001694 Gavlena, F. K. THE "BIGHEAD GOBY", /NEOGOBIUS KESSLERI/, IN VOLGOGRAD RESERVOIR. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 318-319. 1977. SFA 23(3)

[Inst. Biol. Inland Waters, USSR Acad. Sci., Kuybyshev Stn., USSR]

78-001695 Gibson, R. N.; Ezzi, I. A. THE BIOLOGY OF A SCOTTISH POPULATION OF FRIES' GOBY, /LESUERIGOBIUS FRIESII/. J. Fish Biol. 12 (4): 371-389. Apr. 1978. SFA 23(3)

[Dunstoffnage Mar. Res. Lab., Oban, Argyll, Scotland] The biology of a Scottish population of the burrowing goby /Lesueurigobius friesii/ was studied from February 1975 until October 1976. The fish lives at depths of 10-130 m on muddy grounds and attains a length of at least 94 mm and an age of 11 years, females generally living longer than males. Most growth takes place in the first three years of life after which it proceeds very slowly. Marked differences in year-class strength were found. Both sexes mature in their third year and the breeding season lasts from late May until August. Each female can spawn at least twice during this period and the eggs are laid on the roof and sides of the U-shaped burrows which the fish dig in the mud. Fecundity is length dependent and varies between approximately 3-11, 000. The fish feeds predominantly on polychaetes, although small crustacea and molluscs also feature commonly in its diet. No marked diurnal variation in the feeding pattern was noticed, although the amount of food in the stomachs was lowest in the early hours of the morning.

78-001696 Gritsenko, O. F.; Churikov, A. A. THE BIOLOGY OF CHARS (GENUS /SALVELINUS/) AND THEIR PLACE IN THE ICHTHYOCOENOSES OF BAYS IN NORTHEASTERN SAKHALIN. I. MIGRATIONS, AGE, GROWTH AND MATURATION. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (6): 921-930. 1976. SFA 23(3)

[VNIRO, Moscow, USSR] Two species of the genus /Salvelinus/ were investigated: the Arctic char /Salvelinus alpinus kraschenninnikovi/ and the East Siberian char on kundzha /S. leucomaenis/. Estimation was made of the time of the downstream migration and of the return to spawn, and of the duration of the feeding period in the sea; the ratio

78-001696 CONTINUED
of smolts to kelts was determined in the downstream-migrating fish and in the spawning stock. Information is given concerning the age composition of the spawning stocks and the growth of the fish during the marine feeding period.

78-001697 Hecht, T.; Baird, D. CONTRIBUTIONS TO THE BIOLOGY OF THE PANGA, /PTEROGYMNUS LANIARIUS/ (PISCES: SPARIDAE): AGE, GROWTH AND REPRODUCTION. Zool. Afr. 12 (2): 363-372. 1977. SFA 22(3)
[Dep. Zool., Univ. Port Elizabeth, South Africa] All the fish used in this investigation were caught by commercial side trawlers along the eastern Cape coast of South Africa. Age and growth of /P. laniarius/ was determined from otoliths collected monthly from April 1974 to September 1975. The validity of annuli was proved by monthly edge examination of the otoliths. There is no difference in growth between the sexes. The Von Bertalanffy equation L(t)=48,1 (1-e to the -0,19(t + 0,32)) was found to describe the growth of the panga in length. Some fish become sexually mature at a total length of 26 cm. Fifty percent maturity is attained at a length of 28 cm, between the ages of 4 and 5 years. All fish are sexually mature at a total length of 32 cm, at an age of 6 years. The spawning season of the panga extends from mid-September to May.

78-001698 Hecht, T. CONTRIBUTIONS TO THE BIOLOGY OF THE CAPE GURNARD, /TRIGLA CAPENSIS/ (PISCES: TRIGLIDAE): AGE, GROWTH AND REPRODUCTION. Zool. Afr. 12 (2): 373-382. 1977. SFA 23(3)
[Dep. Zool., Univ. Port Elizabeth, South Africa] Study of otoliths of the Cape gurnard, /Trigla capensis/, has established that the rings are annular. An opaque zone is formed from February to July and a hyaline zone during the spawning season from August to March. Females grow faster than males. The Von Bertalanffy growth equation of the females was found to be L(t) = 71,4 (1 - e to the -0,169(t + 0,41)) and for the males L(t) = 58,6 (1 - e to the 0,186(t + 0,28)). Male fishes are sexually mature at a total length of 37 cm at the end of the fifth year. The female fishes are all sexually mature at a total length of 35 cm at the age of four years.

78-001699 Kendall, A. W. BIOLOGICAL AND FISHERIES DATA ON BLACK SEA BASS, /CENTROPRISTIS STRIATA/ (LINNAEUS). U.S. Dep. Commer. Natl. Mar. Fish. Serv. Sandy Hook Lab. Tech. Ser. Rep. No. 7. v + 29p. May 1977. SFA 23(3)
[NMFS, Sandy Hook Lab., Highlands, NJ]

78-001700 Kilambi, R. V.; Robison, W. R.; Adams, J. C. GROWTH, MORTALITY, FOOD HABITS, AND FECUNDITY OF THE BUFFALO RIVER SMALLMOUTH BASS. Proc. Ark. Acad. Sci. 31: 62-65. 1977. SFA 23(3)
[Dep. Zool., Univ Ark., Fayetteville 727011 Total length-scale radius, and length-weight relationships were determined for smallmouth bass from the Buffalo River. The back calculated lengths were used in analyzing the age-length data by the Bertalanffy growth formula. Asymptotic length and weight were estimated as 58.3 cm and 4.6 lbs, respectively. Annual mortality of 36 percent was estimated by the catch curve method. Insects (54 percent), fishes (16 percent), and crayfish (14 percent) were the abundant food organisms by frequency of occurrence; while fishes (64 percent) and crayfish (29 percent) were the dominant food items by the gravimetric method. Based on the gonosomatic indices and frequency distribution of ovum diameter measurements, smallmouth bass spawn during April-June. All ova greater than or equal to 1.1 mm were considered mature and the relationships between total length, weight, and age to fecundity were estimated as:

78-001700 CONTINUED
log F = 5.05 log L - 8.89301; F = 18.56 W - 1680.4; log F = 3.84 log A + 1.51560, respectively.

78-001701 Kolomin, Yu. M. THE NADYM RIVER RUFFE, /ACERINA CERNUA/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 345-349. 1977. SFA 23(3)
[Biol. Biophys. Res. Inst., Tomsk Univ., USSR] The article contains a morphological description of the ruffe, /Acerina cernua/, and information on its migrations and distribution in the Nadym River. Consideration is given to reproduction, growth rate, feeding and parasites.

78-001702 Koskova, L. A. THE BELOZERO (LAKE BELOYE) CISCO (/COREGONUS SARDINELLA VESSICUS/) IN SARATOV RESERVOIR. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 479-483. 1977. SFA 23(3)
[USSR Acad. Sci., Inst. Biol. Inland Waters, Kuybyshev Stn., USSR]

78-001703 Kwei, E. A. FOOD AND SPAWNING ACTIVITY OF /CARANX HIPPOS/ (L.) OFF THE COAST OF GHANA. J. Nat. Hist. 12 (2): 195-215. Mar.-Apr. 1978. SFA 23(3)
[Volta Lake Res. Div. Proj., P.O. Box 88, Akosombo, Ghana] The food of adult /Caranx hippos/ was found to be predominantly /Engraulis guineensis/ (Cuv.) followed by /Sardinella eba/ (Cuv.). The food of juvenile /Caranx hippos/ was either small fish of the species /Epiplatys sexfasciatus/ (Stein) or the juveniles of caridian shrimps, /Macrobrachium/ spp., or peneid shrimps, /Peneus duorarum/ (Burkenroad). The availability of the food in lagoons is inversely correlated with the height of the water. Digestion in the adult was found to be so fast that within 4 to 5 hours the food loses its identity. Availability of food appeared to determine the distribution of /Caranx hippos/. Both adult and juvenile fish were found to feed mostly during the day. There appears to be protracted spawning with most activity taking place between October and late January. Ripe fish, however, were rarely encountered. Juvenile /Caranx hippos/ were present in the lagoon all the year round with minor variations in their abundance, depending on the overall water level.--From summ.

78-001704 Magnin, E.; Clement, A-M.; Legendre, V. CROISSANCE, REPRODUCTION ET REGIME ALIMENTAIRE DES TOULADIS /SALVELINUS NAMAYCUSH/ (WALBAUM) DU NORD DU QUEBEC. [GROWTH, REPRODUCTION AND FEEDING HABITS OF LAKE TROUT /SALVELINUS NAMAYCUSH/ (WALBAUM) OF NORTH QUEBEC] Nat. Can. (Que.) 105 (1): 1-17. Jan.-Feb. 1978. In French with English summ. SFA 23(3)
[Dep. Sci. Biol., Univ. Montreal, C.P. 6128, Montreal H3C 3J7, PQ, Canada] Age was determined in the otoliths of 686 /Salvelinus namaycush/ from drainage basin of Rupert, La Grande Riviere, Grande riviere de la Baleine, Petite riviere de la Baleine et Caniapiscau rivers between latitutes 50° et 55° North. Length and weight growth can be described in that manner: 30 cm and 180 g at 5 years of age, 50 cm and 925 g at 10 years, 60 cm and 2100 g at 20 years, 80 cm and 4000 g at 30 years. Longevity may reach the age of 45 years. Growth, length-weight relationship, condition, fecundity, sexual maturity and feeding were compared with those observed in other parts of Canada. The possible effects of impondment were also considered.

78-001705 Marshall, B. E.; van der Heiden, J. T. THE BIOLOGY OF /ALESTES IMBERI/ PETERS (PISCES: CHARACIDAE) IN LAKE MCILWAINE, RHODESIA. Zool. Afr. 12 (2): 329-346. 1977. SFA 23(3)
[Dep. Natl. Parks Wild Life Manage., McIlwaine Res. Cent., P. Bag 962, Norton, Rhodesia] the population of /Alestes imberi/ in Lake McIlwaine increased greatly in late 1974, but the species is of little economic importance in the lake. The breeding season is short and coincides with the main river floods. Females are larger than males and fecundity is extremely high. Like other /Alestes/ species it is a very versatile feeder, and utilizes mainly insect alates from April to November, and chironomid larvae and pupae from December to March. It is able to take advantage of periodic insect emergences and to utilize some plant material. Zooplankton and fish are not important food items. Condition factors appear to be related to spawning. Growth rates could only be assessed indirectly but appear to be more rapid in Lake McIlwaine than in Lake Kariba.

78-001706 Merrett, N. R. ON THE IDENTITY AND PELAGIC OCCURRENCE OF LARVAL AND JUVENILE STAGES OF PATTAII FISHES (FAMILY MACROURIDAE) FROM 60 N, 20 W AND 53 N, 20 W. Deep-Sea Res. 25 (2): 147-160. Feb. 1978. SFA 23(3)
[Inst. Oceanogr. Sci., Wormley, Godalming, Surrey, England]

78-001707 Moriarty, C. EELS. A NATURAL AND UNNATURAL HISTORY. Universe Books, 381 Park Avenue South, New York 10016 192p. Mar. 1978. Available at $15.00 from publisher.
The first detailed history--with facts, folklore, and uses--of the freshwater and marine eel.

78-001708 Morse, W. W. BIOLOGICAL AND FISHERIES DATA ON SCUP, /STENOTOMUS CHRYSOPS/ (LINNAEUS). U.S. Dep. Commer. Natl. Mar. Fish. Serv. Sandy Hook Lab. Tech. Ser. Rep. No. 12. v + 41p. Jan. 1978. SFA 23(3)
[NMFS, Sandy Hook Lab., Highlands, NJ]

78-001709 Murawski, S. A.; Pacheco, A. L. BIOLOGICAL AND FISHERIES DATA ON ATLANTIC STURGEON, /ACIPENSER OXYRHYNCHUS/ (MITCHILL). U.S. Dep. Commer. Natl. Mar. Fish. Serv. Sandy Hook Lab. Tech. Ser. Rep. No. 10. vii + 69p. Aug. 1977. SFA 23(3)
[NMFS, Sandy Hook Lab., Highlands, NJ]

78-001710 Murawski, S. A.; Frank, D. G.; Chang, S. BIOLOGICAL AND FISHERIES DATA ON BUTTERFISH, /PEPRILUS TRIACANTHUS/ (PECK). U.S. Dep. Commer. Natl. Mar. Fish. Serv. Sandy Hook Lab. Tech. Ser. Rep. No. 6. v + 39p. Mar. 1978. SFA 23(3)
[NMFS, Sandy Hook Lab., Highlands, NJ]

78-001711 Pierce, R. J. LIFE HISTORY AND ECOLOGICAL ENERGETICS OF THE GIZZARD SHAD (/DOROSOMA CEPEDIANUM/) IN ACTON LAKE, OHIO. Ph.D. dissertation, Miami Univ. 214p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(4):1606. Oct. 1977. SFA 23(3)

78-001712 Pitt, T. K. THE BIOLOGY AND FISHERY OF AMERICAN PLAICE (/HIPPOGLOSSOIDES PLATESSOIDES/ [FABRICIUS]) WITH SPECIAL REFERENCE TO THE GRAND BANK. Ph.D. dissertation, Memorial Univ. Newfoundland 1976. From Diss. Abstr. Int. B Sci. Eng. 38(3):1013. Sept. 1977. SFA 23(3)

American plaice (/Hippoglossoides platessoides/) is widely distributed throughout the Northwest Atlantic with the Grand Bank supporting the largest population. Meristics indicated possibly considerable intermingling during pre-metamorphosis stages, but on the Grand Bank at least tagging and growth data suggested little intermingling beyond the early life history stages. Length-age comparisons indicated considerable differences between localities and also gave positive correlations between average length at ages 5 and 15 and probable bottom temperature. Peak spawning occurred from early April on Flemish Cap to early June off Northeast Newfoundland and Labrador. Fifty percent (50 percent) sexual maturity for different localities occurred at 7.8-12.2 years for females and 5.3-7.5 years for males. Although invertebrates, principally benthic forms, occurred most frequently in plaice stomachs from the Grand Bank, capelin and lance made up a major part of the total food weight and were especially important for the southern Grand Bank. Landings of Grand Bank plaice increased from the early 1950's and reached a peak in 1966-68 with a subsequent gradual decline. Increased exploitation was reflected in declines in catch per hour, stock abundance and fishing mortality rates. Stock assessments suggested that removals in the immediate future may be lower than in previous years. However, because of non-reporting of discards of plaice, prediction of yield is difficult.--From abstr.

78-001713 Poznanin, L. P. ,(ed.) ICHTHYOLOGY. Translated from Russian and published for the Department of the Interior and the National Science Foundation, Washington, D.C. by Amerind Publishing Co. Pvt. Ltd., New Delhi, India. 117p. 1977. SFA 23(3)

Limited copies available from Editorial Office, USFWS, Aylesworth Hall-CSU, Fort Collins, CO 80523. The present issue, constituting the fifth in the series "Zoology" has been devoted exclusively to the problems of ichthyology. It starts with some information about the development of this science, with certain numerical data which were collected by the editor of this issue. The review by V.I. Tsvetkova deals with the analysis of the significance of hydrostatic and atmospheric pressure not only in fish but also in some other aquatic animals. In the article by G.A. Malyukina and others the role of olfaction in fish behavior has been dealt with. I.A. Verigina's review presents the latest situation in research on the alimentary tract of the carp.

78-001714 Ronsivalli, L. J. SHARKS AND THEIR UTILIZATION. Mar. Fish. Rev. 40 (2): 1-13. Feb. 1978. SFA 23(3)
[NMFS, Emerson Ave., Gloucester, MA 01930]

78-001715 Setzler, E. M. A QUANTITATIVE STUDY OF THE MOVEMENT OF LARVAL AND JUVENILE SCIAENIDAE AND ENGRAULIDAE INTO THE ESTUARINE NURSERY GROUNDS OF DOBOY SOUND, SAPELO ISLAND, GEORGIA. Ph.D. dissertation, Univ. Ga. 260p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(3):1086. Sept. 1977. SFA 23(3)

78-001716 Smith, W. G.; Wells, A. BIOLOGICAL AND FISHERIES DATA ON STRIPED BASS, /MORONE SAXATILIS/ (WALBAUM). U.S. Dep. Commer. Natl. Mar. Fish. Serv. Sandy Hook Lab. Tech. Ser. Rep. No. 4. iii + 42p. May 1977. SFA 23(3)
[NFMS, Sandy Hook Lab., Highlands, NJ]

78-001717 Thompson, R.; Munro, J. L. ASPECTS OF THE BIOLOGY AND ECOLOGY OF CARIBBEAN REEF FISHES: SERRANIDAE (HINDS AND GROUPERS). J. Fish Biol. 12 (2): 115-146. Feb. 1978. SFA 23(3)
[Minist. Agric. Fish., P.O. Box N3028, Nassau, Bahamas] Hinds and groupers (Teleostei, Serranidae) form a valuable component of catches of reef fishes in the Caribbean Sea and adjacent regions. Investigations of species in Jamaican waters have covered relative and absolute growth rates, spawning seasons, fecundity, size at maturity and at sex change, and size compositions, mortality rates, and relative abundances of exploited and unexploited populations.

78-001718 Volobuyev, V. V. SYSTEMATICS AND ECOLOGY OF THE "NEYVA" (/SALVELINUS NEIVA/) A CHAR FROM LAKE UYEGINSKOYE (OKHOTA RIVER BASIN). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (6): 901-910. 1976. SFA 23(3)
[USSR Acad. Sci., Magadan, USSR] The lake char /Salvelinus neiva/ is one of the main members of the ichthyocoenosis in the lakes of the Okhota River basin. The maximum age of the neyva is 14+ years, but the population is predominantly fish of 6+ and 7+. There are 10 age groups in the spawning part of the populatien. The fish are found to mature at an age of 4+ - 6+. The neyva feeds on 7-8 items in the spring, but the feeding spectrum is narrowed during the period of intensive feeding when the main food items are fishes (24 percent) and molluscs (64 percent). Mass spawning of the neyva begins at the end of September and continues throughout October. The spawning grounds are in the lake on the gravel bottom in the littoral zone. The spawners acquire the strong coloration of the breeding colors at the time of spawning. Morphologically the Uyegenskoye char is similar to the Lake Dal'neye char (Kamchatka); it differs significantly with respect to a number of characters from the diadromous Okhtosk char. Two suggestions may be made concerning the phylogenetic links of the neyva. Firstly, that the neyva is derived from the diadromous char and is ecologically well segregated; secondly, that the neyva is a Quaternary relict, which probably came in from the Arctic Ocean basin via the Lena basin.

78-001719 Vyshegorodtsev, A. A. THE SIBERIAN CISCO, /COREGONUS ALBULA SARDINELLA/, FROM THE YURIBEY RIVER (GYDA BAY BASIN). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 16-24. 1977. SFA 23(3)
[Dep. Gen. Biol., Krasnoyarsk Univ., USSR] The size, age and sexual composition of the siberian cisco, /Coregonus albula sardinella/, was analyzed. The period of feeding and spawning migration, the intensity of the migration and the age of the onset of sexual maturity are given. Data on fecundity and its variation depending on the length, weight and age of fish, state of gonads, feeding and condition factor are presented. The present state of Siberian cisco fishing and its prospects in the near future are examined.

78-001720 Wilk, S. J. BIOLOGICAL AND FISHERIES DATA ON BLUEFISH, /POMATOMUS SALTATRIX/ (LINNAEUS). U.S. Dep. Commer. Natl. Mar. Fish. Serv. Sandy Hook Lab. Tech. Ser. Rep. No. 11. vii + 56p. Aug. 1977. SFA 23(3)
[NMFS, Sandy Hook Lab., Highlands, NJ]

78-001721 Zelinskiy, Yu. P. KARYOTYPES OF THE ATLANTIC SALMON (/SALMO SALAR/) OF THE LANDLOCKED POPULATION OF THE KUYTO LAKES (WHITE SEA BASIN). J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.) 16 (6): 1018-1023. 1976. SFA 23(3)
[Inst. Biol., USSR Acad. Sci., Petrozavodsk, USSR] Study of the chromosome groupings in the cells of the pronephros in a sample of the Atlantic salmon population from the Kuyto Lakes has shown that there are modal values identifiable as 56, 57 and 58 chromosomes with a dominant value of 74 for the number of arms against the background of variability in the number of chromosomes (52-60). Similarity is to be noted in populations from different parts of the range in the general pattern of variability of the chromosome sets. Interpopulational differences are possible in the modal values; in relation to the salmon of the Kuyto Lakes they have a basic karyotype 2n = 56, NF = 74.--Concl.

POPULATION STUDIES, PRODUCTION, ETC.

78-001722 Bartoo, N. W. POPULATION PARAMETER ESTIMATES AND ENERGY BUDGETS FOR PEAMOUTH, NORTHERN SQUAWFISH, AND YELLOW PERCH IN LAKE WASHINGTON. Ph.D. dissertation, Univ. Wash. 157p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(6):2478. Dec. 1977. SFA 23(3)

78-001723 Bryant, M. D. LAKE WASHINGTON SOCKEYE SALMON: BIOLOGICAL PRODUCTION; AND A SIMULATED HARVEST BY THREE FISHERIES. Ph.D. dissertation, Univ. Wash. 173p. 1976. From Diss. Abstr. Int. B Sci. Eng. 38(3):1003. Sept. 1977. SFA 23(3)

78-001724 Dangel, J. R.; Helle, J. H.; Mattson, C. R.; Sears, H. S. SUMMARY OF AGE-WEIGHT-LENGTH DATA FOR SOUTHEASTERN ALASKA CHUM SALMON, 1958-1976. Alaska Dep. Fish Game Tech. Data Rep. No. 34. 650p. 1977. SFA 23(3)
[Alaska Dep. Fish Game, Div. Commer. Fish., Juneau]

78-001725 Dgebuadze, Yu. Yu.; Tryapitsyna, L. N.; Dorozhkina, T. Ya. THE STATE OF THE BREAM (/ABRAMIS BRAMA/) POPULATION AND THE CHARACTERISTICS OF THE GROWTH OF THE BREAM IN LAKE PSKOV-CHUDSKOYE. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (6): 977-987. 1976. SFA 23(3)
[IEMEZh, USSR Acad. Sci., Moscow, USSR] An examination is made of changes in the size and age structure of the bream (/Abramis brama/) population of Lake Pskov-Chudskoye during the period 1972-1974 in connection with the appearance of the strong year-classes of 1966, and 1968 and 1969. The length increase of the bream was not significantly affected. The increase noted in the weight of fish of the same age may be related to favorable feeding conditions for the bream in 1972 and 1973. Analysis of the seasonal dynamics of length and weight increase, and also of condition in years differing in temperature conditions has revealed differences of these indicators in fish of different age and sex. A discrepancy is noted between commercial size and the size of

78-001725 CONTINUED
sexually mature fish; this is one of the factors preventing restoration of the numbers of bream in the lake.

78-001726 Germany, R. D. POPULATION DYNAMICS OF THE BIUE TILAPIA AND ITS EFFECTS ON THE FISH POPULATIONS OF TRINIDAD LAKE, TEXAS. Ph.D. disseration, Tex. A&M Univ. 95p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(4):1537. Oct. 1977. SFA 23(3)

Scales from blue tilapia captured in gill nets indicated that annulus formation occurred primarily in March and April in 1973 and 1974, but in April and May in 1975. Average total length for males was larger than females; average first-year back-calculated growth of males was 197 mm and for females 183 mm. The total population estimate for blue tilapia in December, 1974 was 4,856,963. Of this total 3,120,810 were Age 0 and 1,591,823 were Age I. Biomass estimate for this number of tilapia was 799,978 kg or 2,640 kg/ha. From these estimates the yield of marketable size blue tilapia would be 1,629,501 weighing 521,153 kg. Enough mature tilapia was left to sustain this yield each year. A difference was found in length-weight relationship of female tilapia between 1974 and 1975, also 1973 and 1974. Essentially no other differences were found. Estimate of survival of blue tilapia from Age I to II was calculated to be 7 percent. Catch frequency data indicated a decline in native fish populations until 1975 when the catch frequency for most species increased.

78-001727 Henry, K. A. ESTIMATING NATURAL AND FISHING MORTALITIES OF CHINOOK SALMON, /ONCORHYNCHUS TSHAWYTSCHA/, IN THE OCEAN, BASED ON RECOVERIES OF MARKED FISH. NOAA Fish. Bull. 76 (1): 45-57. Jan. 1978. SFA 23(3)

[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] In this paper I demonstrate the method of calculating estimates of fishing mortality (/F/) and natural mortality (/M/) occurring in the ocean for 1961 and 1962 brood Columbia River hatchery fall chinook salmon, /Oncorhynchus tshawytscha/, based on assumed values of the proportion of fish that mature annually (/m/) and on recoveries of marked fish. The advantages of this method over the method of assuming fixed natural mortality rates and back calculating estimates are discussed. It was possible to develop estimates of 1962 Spring Creek data up to the fourth year of life and to compare these estimates with values for the 1961 brood whereas no estimates had been possible with the back calculation method. Thus, estimates of /M/(1) are higher for the 1962 brood; estimates of /M/(2) are very similar for the two broods and the estimates of /M/(3) are slightly higher for the 1962 brood. A major difference between the two methods is that natural mortality was assumed to be constant for the back calculation method whereas estimates of natural mortality were obtained separately each year using assumed proportions maturing. Thus, for the 1962 brood general marked fish, an /M/ = 0.60 was used in the back calculation method while estimates of /M/(1) = 5.814, /M/(2) = 0.510, /M/(3) = 0.653, and /M/(4) = 0.727 were obtained by assuming varying proportions maturing. A series of graphs are developed that permit a quick analysis of any combination of proportions of fish maturing, fishing mortality, and natural mortality and which clearly depict the relationship between these various factors.

78-001728 Jensen, K. W. ON THE DYNAMICS AND EXPLOITATION OF THE POPULATION OF BROWN TROUT, /SALMO TRUTTA/ L., IN LAKE OVRE HEIMDALSVATN, SOUTHERN NORWAY. Inst. Freshwater Res. Drottningholm Rep. No. 56. p. 18-69. 1977. SFA 23(3)

[Dir. Wildl. Freshwater Fish, N-1430 As, Norway] The fishery in Lake Ovre Heimdalsvatn has been completely controlled since 1958. Brown trout and a negligibly small population of minnows are the only fish species present. In 1957-58 the lake harboured a very dense trout population which was substantially reduced by heavy fishing in the following years. The reduction of the population density led to a substantial increase in growth rates. The increased fishing mortality caused a very pronounced decrease in the fraction of adult trout in the population. Simulation of different levels of recruitment showed that at low levels of recruitment the mean size in the catch could be more than doubled, but the sustainable yield would decrease substantially. The combination big-sized trout and high sustained yield can not be obtained. Some simple methods to obtain rough estimates of a trout lake's yield potential were discussed.--From summ.

78-001729 Kennedy, G. J. A.; Strange, C. D. SEVEN YEARS ON--A CONTINUING INVESTIGATION OF SALMONID STOCKS IN LOUGH ERNE TRIBUTARIES. J. Fish Biol. 12 (4): 325-330. Apr. 1978. SFA 23(3)

[Fish. Res. Lab., The Cutts, Coleraine, Co. Londonderry, Northern Ireland] An electrofishing survey of Lough Erne spawning streams indicates a continued decline in the populations of juvenile salmonids. This is particularly the case with salmon stocks, which are now seriously depleted or absent from the sampled areas. This finding complies with the recorded decline in the adult salmon escapement to the Erne system. Stocking operations of both salmon and trout appear to have been successful in boosting recruitment only on a localised basis.

78-001730 Li, H.; Mosman, N. J. ANALYSIS OF THE CLEAR LAKE COMMERCIAL FISHERY USING DIFFERENT SURPLUS YIELD MODELS. Cal-Neva Wildl. Trans. 1977: 112-117. 1977. Copies available from The Wildlife Society, 4606 San Marino Drive, Davis, CA 95616. SFA 23(3)

[Univ. Calif., Berkeley] The status of the Clear Lake carp (/Cyprinus carpio/) and blackfish (/Orthodon microlepidotus/) are examined using the trends of the data and four surplus-yield models. All models, regardless of precision, seem to indicate that both the carp and blackfish populations are declining.

78-001731 Liss, W. J. TOWARD A GENERAL THEORY OF EXPLOITATION OF FISH POPULATIONS. Ph.D. dissertation, Oreg. State Univ. 108p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(3):981. Sept. 1977. SFA 23(3)

A possible form of theory of exploitation of fish populations was examined. The exploitation theory was derived from a theory of community dynamics that represents the interactions between populations in a biological community with complex interrelated systems of isoclines on phase planes. The isocline systems are deduced, with a graphical calculus, from response functions that represent the biological characteristics of each of the interacting populations. The time-invariant systems of isoclines and the response functions from which they are deduced underlie, determine, and so explain time-variant population performances.--From abstr.

78-001732 Newcome, N. , (ed.) 1976 BRISTOL BAY SOCKEYE SALMON SMOLT STUDIES. A SUMMARY OF DATA COLLECTED FROM SOCKEYE SALMON (/ONCORHYNCHUS NERKA/) SMOLT PROGRAMS ON THE KVICHAK, NAKNEK, AND WOOD RIVERS. Alaska Dep. Fish Game Tech. Data. Rep. No. 33. iii + 39p. 1977. SFA 23(3)
[Alaska Dep. Fish Game, Div. Commer. Fish., Res. Stn., Anchorage]

78-001733 Parrish, R. H. AN ASSESSMENT OF ENVIRONMENTALLY RELATED VARIATION IN THE RECRUITMENT OF THE CALIFORNIA CURRENT STOCK OF PACIFIC MACKEREL (/SCOMBER JAPONICUS/) AND ITS IMPLICATIONS FOR MANAGEMENT. Ph.D. dissertation, Oreg. State Univ. 135p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(10):4591. Apr. 1978. SFA 23(3)
Long-term oceanographic and meteorological data were used to develop models that describe the observed variation in the recruitment of the Pacific mackerel in the California Current region. The models that were found to best describe recruitment included both density-dependent factors and environmental factors. A model including three environmental factors and a density function was selected as the best fit to the longer period. In this model increased recruitment was associated with increased sea surface temperature, reduced sea level, and reduced atmospheric pressure during the spawning season. This model accounted for 59 percent of the variation in recruitment from 1931-1968. The model fitted to the 1946-1968 period included a density function and two environmental factors, on which data was not available prior to 1946. Increased recruitment with this model was associated with increased coastal upwelling and decreased offshore convergence during the spawning season. This model accounted for 76 percent of the variation in recruitment from 1946-1968. Yield per recruit simulations gave greatly different results than dynamic pool simulations. Maximum yield with a yield per recruit model occurs with an age at recruitment of 1 or less and instantaneous fishing mortalities (F) in excess of 1.0. Dynamic pool simulations that incorporate a Ricker spawner-recruit function predict that extinction of the stock will occur with the above fishing strategy. Dynamic pool simulations with both density-dependent and environmental-dependent recruitment functions were assessed to determine maximum yield with different ages at recruitment and different quota options.--From abstr.

78-001734 Payer, R. D.; Scalet, C. G. POPULATION AND PRODUCTION ESTIMATES OF FATHEAD MINNOWS IN A SOUTH DAKOTA PRAIRIE WETLAND. Prog. Fish-Cult. 40 (2): 63-66. Apr. 1978. SFA 23(3)
[Reg. V Headquarters, Minn. Dep. Nat. Resour., Rochester 55901]

78-001735 Pirtle, R. B. HISTORICAL PINK AND CHUM SALMON ESTIMATED SPAWNING ESCAPEMENTS FROM PRINCE WILLIAM SOUND, ALASKA STREAMS, 1960-1975. Alaska Dep. Fish Game Tech. Data Rep. No. 35. iv + 332p. 1977. SFA 23(3)
[Alaska Dep. Fish Game, Div. Commer. Fish., Cordova]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

78-001736 Altukhov, K. A. ON THE REPRODUCTIVE BIOLOGY OF THE CAPELIN (/MALLOTUS VILLOSUS/) IN THE WHITE SEA. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 410-116. 1977. SFA 23(3)
[White Sea Biol. Stn., Ukrainian Fish. Res. Inst., USSR] Information is given concerning the distribution and environmental conditions of larval capelin (/Mallotus villosus/) in the White Sea. The assumed spawning grounds of the capelin are identified by the concentration of prolarvae and early larvae. The importance of individual regions for the spawning movements of the capelin is established.

78-001737 Berenbeym, D. Ya. HYDROMETEOROLOGICAL FEATURES OF THE PRE-SPAWNING MIGRATIONS AND TIMES OF COMMENCEMENT OF SPAWNING OF THE AZOV ANCHOVY, /ENGRAULIS ENCRASICHOLUS MAEOTICUS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 126-133. 1977. SFA 23(3)
[AtlantNIRO, Kaliningrad, USSR] Mean speed of spring migration of the Azov anchovy in the Black Sea is 0.1-0.3 m/sec; it is comparable with the speed of the main current in the Black Sea. A high correlational dependence is established between dates of appearance of the anchovy in Kerch Strait and the mean daily water temperature at Anapa hydrometeorological station in April. In spring the anchovy most frequently passes through Kerch Strait along the navigation channel and less frequently along the Crimean and Kuban coasts. There is a direct link between the date of entry of the anchovy into the Sea of Azov and the date of onset of spawning. The determining factor of the onset of spawning is constituted by the conditions of existence of the anchovy in the Black Sea. The environmental conditions in the Sea of Azov during the pre-spawning period have no substantial influence on times of onset of spawning.--Concl.

78-001738 Chapman, R. W. OBSERVATIONS OF SPAWNING BEHAVIOR IN ATLANTIC SPADEFISH, /CHAETODIPTERUS FABER/. Copeia 1978 (2): 336. 5 May 1978. SFA 23(3)
[Dep. Zool., Univ. Ga., Athens 30602]

78-001739 Colin, P. L. DAILY AND SUMMER-WINTER VARIATION IN MASS SPAWNING OF THE STRIPED PARROTFISH, /SCARUS CROICENSIS/. NOAA Fish. Bull. 76 (1): 117-124. Jan. 1978. SFA 23(3)
[Dep. Mar. Sci., Univ. Puerto Rico, Mayaguez 00708] The "striped" phase of the striped parrotfish, /Scarus croicensis/, engaged in mass spawning during afternoon periods on a deep (24 m) coral pinnacle off Discovery Bay, Jamaica. During morning periods the fish occurred in a large foraging group on shallow reefs and moved to the spawning site in early afternoon. The occurrence of spawning rushes per day in June was about six times that during January. /Chromis cyanea/ and /Clepticus parrai/ fed on freshly released eggs of /S. croicensis/. Mass spawning by /S. croicensis/ was similar to that of /Sparisoma rubripinne/.

78-001740 Gerking, S. D.; Lee, R.; Shrode, J. B. EFFECTS OF GENERATION-LONG TEMPERATURE ACCLIMATION ON REPRODUCTIVE PERFORMANCE OF THE DESERT PUPFISH, /CYPRINODON N. NEVADENSIS/. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 335. July 1977. Abstract only. SFA 23(3)

[Dep. Zool., Ariz. State Univ., Tempe] The hypothesis was tested that reproductive temperature tolerance limits would be subject to temperature acclimation in a manner analagous to the effect of acclimation on upper and lower lethal temperature limits. Desert pupfish, /Cyprinodon n. nevadensis/, were bred and the eggs reared at the optimum temperature for reproduction, 28 C, and at two marginal temperatures, 24 and 32 C. Each brood was divided into three groups and reproductive performance was tested at the acclimation temperature and at the two alternate temperatures. The eggs laid per spawning and eggs laid per gram body weight per day showed no adaptation to temperature. Reproductive performance was optimal at the 28 C temperature regime and was poor at the marginal temperatures, regardless of the previous thermal history of the fish.

78-001741 Glebe, B. D. WEIGHT LOSS AND ASSOCIATED ENERGY EXPENDITURE OF AMERICAN SHAD (/ALOSA SAPIDISSIMA/, WILSON) DURING THE FRESHWATER SPAWNING MIGRATION. Ph.D. dissertation, McGill Univ. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(10):4621. Apr. 1978. SFA 23(3)

The nature and extent of weight loss and energy utilization by shad, which do not feed in freshwater, was studied in three Atlantic coast rivers. The variables influencing the rate and extent of energy utilization were distance to spawning areas, water temperature and current velocity, and extent of gonad development in freshwater. Distance was the most important determinant of total energy demand associated with the freshwater migration. Shad appeared to be highly adapted both energetically and reproductively to their specific home rivers. Larger body size and later mean age at maturity of Connecticut River shad may be an adaptation to increase energy reserves and thereby enhance postspawning survival necessary for population stability in a fluctuating environment. Florida shad maintain a high reproductive potential, despite small body size and complete postspawning mortality, by greatly increasing relative fecundity. Higher fecundity is possible by a reduced allocation of energy per ovum. Furthermore, the migration rate of shad, near the speed of maximum metabolic efficiency (one body length/sec), may be an adaptation to maximize spawning success and postspawning survival by reducing the energetic cost of swimming. Extension of the Connecticut River migration to the historical range of the species in the river will significantly alter the population structure. Shad spawning in areas above existing sites will experience significantly higher energy costs and proportionately higher postspawning mortality. Thus an increasing proportion of virgin fish in the Connecticut population is predicted as the restoration program proceeds.--From abstr.

78-001742 Goldberg, S. R. REPRODUCTIVE CYCLE OF THE WHITE SEAPERCH, /PHANERODON FURCATUS/ (EMBIOTOCIDAE). Copeia 1978 (2): 334-336. 5 May 1978. SFA 23(3)

[Dep. Biol., Whittier Coll., Whittier, CA 90608]

78-001743 Gomelyuk, V. Ye. INFLUENCE OF ENVIRONMENTAL FACTORS ON MALE PARENTAL BEHAVIOR OF WHITE SEA THREESPINE STICKLEBACK (/GASTEROSTEUS ACULEATUS/). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (6): 949-958. 1976. SFA 23(3)

[IEMEZh, USSR Acad. Sci., Moscow, USSR] The influence of environmental factors on the behavior of threespine stickleback (/Gasterosteus aculeatus/) males during their parental care period was studied in the littoral zone of the White Sea. Different forms of the active behavior of males are connected with the rhythmic pattern of the incoming and outgoing tides, which alter the conditions under which food and predators enter the territory defended by the male.

78-001744 Mahadevan Pillai, P. K.; Devadoss, P. A NOTE ON THE FECUNDITY AND SPAWNING PERIOD OF /DREPANE PUNCTATA/ (LINNAEUS). Indian J. Fish. 22 (1,2): 262-264. 1975. SFA 23(3)

[Chavakad Field Cent. C.M.F.R. Inst., Chavakad, India]

78-001745 Muench, K. A. BEHAVIORAL ECOLOGY AND SPAWNING PERIODICITY OF THE GULF OF CALIFORNIA GRUNION, /LEURESTHES SARDINA/. Ph.D. dissertation, Univ. Ariz. 104p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(3):1086. Sept. 1977. SFA 23(3)

The spawning behavior of the Gulf grunion is similar to that of the California grunion, /L. tenuis/, except that Gulf grunion do not dig as deeply into the sand and show a greatly accelerated spawning act (3 to 4 sec) as compared to a slower spawning act (30 sec) of the California grunion. This difference appears to be an adaptation to the short period, low amplitude sea waves typical of the protected coasts of the upper Gulf of California rather than increased daytime predation of spawning fish by sea birds. Initiation of a spawning run seems to be more directly dependent upon tidal amplitude than the moon phase /per se/. Gulf grunion runs occur fortnightly from January to May following a descending series of high tides after the new and full moon phases. The beginning of a run series occurs about 3 days after the full moon and about 4 days after the new moon phase. The daytime runs of /L. sardina/ commence when there is mid-season shift in the time of daily higher high tides from early morning (0300-0500) to late afternoon (1500-1700). Predictions of Gulf grunion spawning runs at El Golfo de Santa Clara, based upon tidal amplitudes in relation to moon phase, proved to be reasonably accurate. However, publication of predictions of Gulf grunion runs should be discouraged until conservation measures are established to manage the resource and regulate the catch of spawning adults.--From abstr.

78-001746 Nance, S. SOME ASPECTS OF THE REPRODUCTIVE BIOLOGY OF THE LOGPERCH, /PERCINA CAPRODES/ (RAFINESQUE), FROM EAST LYNN LAKE, WAYNE COUNTY, WEST VIRGINIA. Proc. W. Va. Acad. Sci. 50 (1): 25. 1978. Abstract only. SFA 23(3)

[Dep. Biol. Sci., Marshall Univ., Huntington, WV 257011] Examination of the gonads of 152 Logperch, /Percina caprodes/ (Rafinesque), from East Lynn Lake, Wayne Co., W. Va., showed that averages of the percentage of gonad weight and body weight attained their maxima for females (2.39 percent) and males (0.27 percent) by late May. By late June, the percentages between gonad weight and body weight had stabilized near the minimum for both sexes. The water temperature at this time was 27.6 C. Ova reached their maximum diameter, 107 mm (range 0.67-1.34 mm), in late May. Mature egg counts ranged from 97 to 611 per female; the mean was 279. There were no significant differences (t-test, 0.05 confidence level) between the male and female proportions measured in this population. The chi-square test (0.05 confidence level) indicated no significant departure from the 1:1

78-001746 CONTINUED
sex ratio.

78-001747 Nikolayev, A. S. SALMON MOVEMENTS IN KAMCHATKA BAY. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 133-142. 1977. SFA 23(3)
[KoTINRO, Petropovlovsk-Kamchatskiy, USSR] The movements of adult sockeye, /Oncorhynchus nerka/, chum salmon, /O. keta/, pink salmon, /O. gorbuscha/, and chinook salmon, /O. tschawytscha/, were studied in Kamchatka Bay in June-July 1972. It was established that the diurnal dynamics of behavior of the migrants travelling at a speed of around 1 knot are determined by tidal ebb and flow.

78-001748 Olatunde, A. A. SEX, REPRODUCTIVE CYCLE AND VARIATIONS IN THE FECUNDITY OF THE FAMILY SCHILBEIDAE (OSTEICHTHYES: SILURIFORMES) IN LAKE KAINJI, NIGERIA. Hydrobiologia 57 (2): 125-142. 21 Jan. 1978. SFA 23(3)
[Zool. Dep., Univ. Reading, Reading, Berks, England] The sex, reproductive cycle and variations in the fecundity of the family Schilbeidae (Osteichthyes: Siluriformes) in Lake Kainji, were investigated. Sexual differences in size and morphology were found to exist in all species. Sex ratio varied with species and season. There were more females than males in the population. Size at maturity varied from species to species with the males attaining maturity at a slightly lower length than the females. Breeding condition was attained mainly during the rains in /Eutrophius niloticus/, /Schilbe mystus/ and /Siluranodon auritus/ and in the dry and rainy seasons in /Physalia pellucida/. Spawning occurred once during the breeding season in /E. niloticus/ and /S. mystus/; and more than once during the prolonged breeding season in /P. pellucida/. Condition factors did not show any correlation with maturation of gonads. Fecundity was found to vary from species to species.

78-001749 Panek, F. M.; Cofield, C. R. FECUNDITY OF BLUEGILL AND WARMOUTH FROM A SOUTH CAROLINA BLACKWATER LAKE. Prog. Fish-Cult. 40 (2): 67-68. Apr. 1978. SFA 23(3)
[N.Y. Dep. Environ. Conserv., Bur. Fish., Watertown 13619]

78-001750 Platts, W. S.; Partridge, F. E. REARING OF CHINOOK SALMON IN TRIBUTARIES OF THE SOUTH FORK SALMON RIVER, IDAHO. U.S. For. Serv. Intermt. For. Range Exp. Stn. Res. Pap. INT-205. 11p. 1978. SFA 23(3)
[U.S. For. Serv., 316 Myrtle St., Boise, ID 83706] Fish populations in 23 tributaries of the South Fork Salmon River were sampled in 1971, 1972, and 1974. Juvenile chinook salmon were found in one secondary and 11 primary tributaries. The first 400 m reach of stream adjacent to the river was the most important area for rearing and supported 58 percent of the total tributary chinook salmon population. Only three tributaries had chinook salmon more than 1.6 km from the river. The tributary chinook salmon standing crop ranged from 0.01 to 0.38/m^2 and averaged 0.06/m^2 for all streams. Chinook salmon were rearing with rainbow trout and sculpin over most of their tributary range and occasionally with brook trout, Dolly Varden, mountain whitefish, mountain suckers, and dace. Cutthroat trout and chinook salmon were not found together. Chinook salmon preferred the larger, lower gradient, grassy-banked streams having deep pools. Chinook salmon were found in the fluvial and depositional landtype associations but mainly in the alluvial and alluvial fan landtypes.

78-001751 Poole, B. M. OFF-SEASON SPAWNING OF ATLANTIC SILVERSIDES. Prog. Fish-Cult. 40 (2): 72. Apr. 1978. SFA 23(3)
[Sea Plantations, Inc., 29 Congress St., Salem, MA 01970]

78-001752 Ross, M. R.; Reed, R. J. THE REPRODUCTIVE BEHAVIOR OF THE FALLFISH /SEMOTILUS CORPORALIS/. Copeia 1978 (2): 215-221. 5 May 1978. SFA 23(3)
[Mass. Coop. Fish. Res. Unit, Univ. Mass., Amherst 01003]

78-001753 Settles, W. H.; Hoyt, R. D. THE REPRODUCTIVE BIOLOGY OF THE SOUTHERN REDBELLY DACE, /CHROSOMUS ERYTHROGASTER/ RAFINESQUE, IN A SPRING-FED STREAM IN KENTUCKY. Am. Midl. Nat. 99 (2): 290-298. Apr. 1978. SFA 23(3)
[Biol. Dep., West. Ky. Univ., Bowling Green 42101] The reproductive biology of the southern redbelly dace, /Chrosomus erythrogaster/ Rafinesque, was studied in Ivy Creek, Warren Co., Kentucky, from 1971 to 1972. Reproduction occurred from mid-April through June. Older adults spawned in April and May, early in the reproductive period, while younger adults, in the latter part of their 1st year of life, spawned during May and June. Age Group 0 specimens represented the majority of the reproductive population. The number of mature eggs per female ranged from 140-681 (mean = 316). Ova diameter exhibited an inverse relationship with standard length, while a positive correlation existed between number of mature eggs and standard length. Differences between the sexes were marked and included intensity and distribution of pigmentation, breeding tubercle development and length and shape of the pectoral fins. Males were most distinctive, having prominent scarlet ventral surfaces and breeding tubercles on the head and fins during the reproductive period. Males had longer and broader pectoral fins. No significant deviation from a 1:1 sex ratio was observed.

78-001754 Sil'chenko, G. F. REPRODUCTION OF SICHEI (/PELECUS CULTRATUS/) STOCKS IN KUYBYSHEV RESERVOIR. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (6): 931-939. 1976. SFA 23(3)
[GosNIORKh, Kazan, USSR] A study was made of the size-age and sexual composition of the spawning part of the sichel (/Pelecus cultratus/) stock now that the Kuybyshev Reservoir has been in existence for 12 years. Information is given on the reproduction, fecundity and abundance of the sichel.

78-001755 Sokolov, L. I.; Malyutin, V. S. FEATURES OF THE POPULATION STRUCTURE AND CHARACTERISTICS OF SPAWNERS OF THE SIBERIAN STURGEON, /ACIPENSER BAERI/, IN THE SPAWNING GROUNDS OF THE LENA RIVER. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 210-218. 1977. SFA 23(3)
[Dep. Ichthyol., Moscow Univ., USSR] The structural features of the population and the biological indicators of the spawners of the Siberian sturgeon, /Acipenser baeri/, from the Lena River were studied in the spawning area. Data are given on the times of its spawning migration, the size-age composition of spawning fish, the ratio of the sexes and fecundity.

78-001756 Wootton, R. J.; Evans, G. W.; Mills, L. ANNUAL CYCLE IN FEMALE THREE-SPINED STICKLEBACKS (/GASTEROSTEUS ACULEATUS/ L.) FROM AN UPLAND AND LOWLAND POPULATION. J. Fish Biol. 12 (4): 331-343. Apr. 1978. SFA 23(3)
[Dep. Zool., Univ. Coll. Wales, Aberrystwyth, Dyfed, Wales]

78-001757 Zver'kova, L. M. MATURATION, FECUNDITY AND SPAWNING GROUNDS OF THE WALLEYE POLLOCK (/THERAGRA CHALCOGRAMMA/) IN THE NORTHEAST OF THE SEA OF JAPAN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 404-410. 1977. SFA 23(3)
[SakhTINRO, Yuzhno-Sakhalinsk, USSR] The walleye pollock reaches sexual maturity at an age of 3-4 years and a body length of 30-40 cm in the northeastern part of the Sea of Japan. Males are most numerous in the spawning population of the walleye pollock in fish maturing for the first time and middle aged fish; females predominate among older fish. This apparently ensures high population of fecundity of the pollock. The walleye pollock spawns in the winter and spring, and the larvae hatch in the spring. Hatching is synchronized with mass development of the phytoplankton, and also of the eggs and nauplial stages of Copepoda. Walleye pollock eggs are laid and develop in the northeastern part of the Sea of Japan in a zone in which the water masses of the Pacific and the Sea of Japan mix. The walleye pollock is typified by comparatively high fecundity. Among the fish that constitute the basis of the spawning population (age 4-9 years) absolute fecundity is 95-361 thousand eggs per female. The increment of fecundity continues to increase in the course of ontogeny to an age of 8 years inclusive; in older fish the increment is appreciably reduced.

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

78-001758 Ben-Tuvia, A. IMMIGRATION OF FISHES THROUGH THE SUEZ CANAL. NOAA Fish. Bull. 76 (1): 249-255. Jan. 1978. SFA 23(3)
[Dep. Zool., Hebrew Univ. Jerusalem, Jerusalem, Israel]

78-001759 Claridge, P. N.; Gardner, D. C. GROWTH AND MOVEMENTS OF THE TWAITE SHAD, /ALOSA FALLAX/ (LACEPEDE), IN THE SEVERN ESTUARY. J. Fish Biol. 12 (3): 203-211. Mar. 1978. SFA 23(3)
[Sch. Biol. Sci., Univ. Bath, Claverton Down, Bath BA2 7AY, England] Between July 1974 and April 1977, appreciable numbers of 0 group twaite shad, /Alosa fallax/, have been collected from the cooling water intake screens of the Nuclear Power Stations at Oldbury-upon-Severn and Berkeley on the Severn Estuary and at Hinkley Point on the Bristol Channel, England. Young of the year first appeared at Oldbury in July at a size of approximately 32 mm standard length, and grew to approximately 61 mm by October. The downstream migration in the late summer and autumn appeared to be closely correlated with water temperature since movement reached a peak soon after the temperature in the Estuary had declined below 19°C, and ceased altogether below 9°C. Thereafter, there was virtually no movement of shad until temperatures rose sharply above 7°C in the spring. Maturing adult twaite shad were captured in late April and May as they moved into freshwater to spawn, probably in mid-June. Males were recorded slightly earlier during the migration and were generally younger than females. Furthermore, mean lengths and weights for individuals belonging to the different age classes indicated that males were also smaller. Logarithmic raltionships between length and weight of young and adult /A. fallax/ and for the variation with size in the number of

78-001759 CONTINUED
rakers on the first gill arch are presented.

78-001760 Fried, S. M. SEAWARD MIGRATION OF HATCHERY-REARED ATLANTIC SALMON (/SALMO SALAR/) SMOLTS IN THE PENOBSCOT RIVER ESTUARY, MAINE: RIVERINE MOVEMENTS. Ph.D. dissertation, Univ. Me. 63p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(4):1603. Oct. 1977. SFA 23(3)

Forty-six hatchery-reared Atlantic salmon, /Salmo salar/, smolts tagged internally with ultrasonic telemetry transmitters were tracked in the Penobscot River estuary, Maine. Mean travel times of six smolts tracked from head of tide 35 km seaward to the river mouth ranged from 29.4-44.5 h (mean 37.1 h). During 1975 and 1976 onset of increased activity of smolts occurred when hatchery and river water temperatures rose past 5 C. Full expression of migratory behavior occurred at temperatures above 8 C. Earlier increased activity in 1976 coincided with earlier warming trends. The first long seaward track was made 10 May both years indicating that factors other than water temperature (e.g., photoperiod) were important for onset of migratory behavior. Migrating smolts usually traveled in the main channel during times of peak current flow, but smolts often traveled close to shore, sometimes in shallow water. Water current was the main factor influencing routes and rates of smolt movement. Smolts usually moved in the same direction as current flow during both ebb and flood tide. Mass releases of 1, 3 and 5 m current drift drogues from head of tide during ebb tide suggested that seaward progress of smolts was due mainly to passive drift. This was confirmed by simultaneous tracking of 1 and 3 m drogues together with smolts during five tracks. No diel rhythm and no effect of light conditions were noted in the movement pattern of any smolt. This study substantiates previous indications that smolt migration through the estuary is effected relatively quickly. Migration, at least in the riverine portion of the estuary, is a passive, undirected event and no evidence of either active, oriented swimming or modulated drifting was found.--From abstr.

78-001761 Haynes, J. M.; Gray, R. H.; Montgomery, J. C. SEASONAL MOVEMENTS OF WHITE STURGEON (/ACIPENSER TRANSMONTANUS/) IN THE MID-COLUMBIA RIVER. Trans. Am. Fish. Soc. 107 (2): 275-280. Mar. 1978. SFA 23(3)

[Dep. Biol. Sci., State Univ. Coll., Brockport, NY 14420]

78-001762 Huish, M. T.; Benedict, C. SONIC TRACKING OF DUSKY SHARKS IN THE CAPE FEAR RIVER, NORTH CAROLINA. J. Elisha Mitchell Sci. Soc. 93 (1): 21-26. 1977. SFA 23(3)

[N. Car. Coop. Fish. Res. Unit, N. Car. State Univ., Raleigh 27607] Ten dusky sharks (/Carcharhinus obscurus/) were tracked in the estuary of the Cape Fear River, North Carolina by using sonic transmitters. Tracking times varied from 0.7 to 13 h and distances traveled ranged from 0.1 to 16.8 km. Average rate of movement was 0.8 km/h. The sharks generally moved away from the tagging sites and remained in deeper waters.

78-001763 McCall, T. C. MOVEMENT OF CHANNEL CATFISH, /ICTALURUS PUNCTATUS/, IN CHOLLA LAKE, ARIZONA, AS DETERMINED BY ULTRASONIC TRACKING. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 359-366. July 1977. SFA 23(3)

[Dep. Biol. Sci., North. Ariz. Univ., Flagstaff 86011] Six channel catfish, /Ictalurus punctatus/, were tagged with ultrasonic transmitters operating at a pulsed frequency of 74 kHz, and released in Cholla Lake, Arizona. Transmitters were attached by insertion into the gut and surgical implantation into the peritoneal cavity.

78-001763 CONTINUED
Experimental fish were monitored monthly during 24 hour tracking sessions from August 1976 to June 1977 (628 locations). The mean home range for all tagged fish during the 11 month study was 483,138m² and the diel travel distance ranged from 210m to 2,122m with a mean of 638m. Fish were found associated with narrow-leaf pondweed, /Potomogeton filiformis/, 29 percent of the tracking time and displayed a seasonal migration within the reservoir in response to the fluctuating water temperature.

78-001764 Nixon, D. E.; Miller, R. L. MOVEMENTS OF GRASS CARP, /CTENOPHARYNGODON IDELLA/, IN AN OPEN RESERVOIR SYSTEM AS DETERMINED BY UNDERWATER TELEMETRY. Trans. Am. Fish. Soc. 107 (1): 146-148. Jan. 1978. SFA 23(3)
[Fla. Game Fresh Water Fish Comm., Panama City 32405]

78-001765 Pavlov, D. S.; Pakhorukov, A. M.; Kuragina, G. N.; Nezdoliy, V. K.; Nekrasova, N. P.; Brodskiy, D. A.; Ersler, A. L. SOME FEATURES OF THE DOWNSTREAM MIGRATIONS OF JUVENILE FISHES IN THE VOLGA AND KUBAN RIVERS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 363-374. 1977. SFA 23(3)
[IEMEZh, Glavrybvod, USSR] The pattern of downstream migration of juveniles of various fish species in the Volga and Kuban rivers was studied. With the exception of clupeids 6-10 mm long, a daily migratory rhythm was found in all the fish species investigated. The migration is associated with the loss of visual orientation by the fish and is observed only during the hours of darkness. The downstream migration continues round the clock in the Kuban River owing to the low transparency of the water. A dynamic pattern has been established in the vertical distribution of downstream migrating cyprinid, clupeid and gobiid juveniles throughout the 24 hours. Some features of the horizontal distribution of juveniles are noted. The distribution of juvenile fishes in the river is regarded as an active process controlled by definite behavioral reactions.

78-001766 Smith, W. G.; Sibunka, J. D.; Wells, A. DIEL MOVEMENTS OF LARVAL YELLOWTAIL FLOUNDER, /LIMANDA FERRUGINEA/, DETERMINED FROM DISCRETE DEPTH SAMPLING. NOAA Fish. Bull. 76 (1): 167-178. Jan. 1978. SFA 23(3)
[NMFS, Sandy Hook Lab., Highlands, NJ 07732] A 72-h study to investigate diel movements of yellowtail flounder larvae indicated that they exhibited pronounced vertical movements that were repetitious from day to day. Collections at 3-h intervals with 20-cm bongo nets revealed that larvae were near the surface at night, and mostly at a depth of 20 m during the day. Ascent and descent occurred largely at sunset and sunrise, respectively. Thermal gradients at 10 to 20 m and 30 to 40 m had no apparent influence on the vertical movements. Amplitude of the movements increased with the size of larvae. Recently hatched larvae remained near the shallow thermal gradient. Intermediate sized larvae migrated from middepths during the day to surface and near-surface at night. Large larvae moved throughout the water column. The incidence of feeding was low but a daily feeding pattern was evident. Most larvae with gut contents were collected from 1900 to 0100 h on the first day; from 1600 to 2200 h on the second day; and from 1600 to 0100 h on the third day. The near-absence of gut contents in larvae caught during morning daylight hours suggests that the onset of feeding is triggered by something other than, or in addition to, light. Wind driven circulation near the surface was thought to transport larvae at night, when they moved towards the surface. Subsurface circulation was sluggish and ineffective as a transporting mechanism.

FOODS AND FEEDING

78-001767 Bray, R. N.; Hixon, M. A. NIGHT-SHOCKER: PREDATORY BEHAVIOR OF THE PACIFIC ELECTRIC RAY (/TORPEDO CALIFORNICA/). Science 200 (4339): 333-334. 21 Apr. 1978. SFA 23(3)
[Mar. Sci. Inst., Univ. Calif., Santa Barbara 93106] Diving observations off Santa Barbara, California, indicate that Pacific electric rays (/Torpedo californica/) enter inshore reefs at night and actively prey on fish with the aid of powerful electric discharges.

78-001768 Colle, D. E.; Shireman, J. V.; Rottmann, R. W. FOOD SELECTION BY GRASS CARP FINGERLINGS IN A VEGETATED POND. Trans. Am. Fish. Soc. 107 (1): 149-152. Jan. 1978. SFA 23(3)
[Sch. For. Resour. Conserv., Univ. Fla., Gainesville 32611]

78-001769 Crisp, D. T.; Mann, R. H. K.; McCormack, J. C. THE EFFECTS OF IMPOUNDMENT AND REGULATION UPON THE STOMACH CONTENTS OF FISH AT COW GREEN, UPPER TEESDALE. J. Fish Biol. 12 (4): 287-301. Apr. 1978. SFA 23(3)
[R. H. K. Mann: The River Lab., East Stoke, Wareham, Dorset, England]

78-001770 De Silva, S. S.; Kortmulder, K.; Wijeyaratne, M. J. S. A COMPARATIVE STUDY OF THE FOOD AND FEEDING HABITS OF /PUNTIUS BIMACULATUS/ AND /P. TITTEYA/ (PISCES, CYPRINIDAE). Neth. J. Zool. 27 (3): 253-263. Sept. 1977. SFA 23(3)
[Dep. Zool., Vidyalankara Campus, Univ. Sri Lanka, Kelaniya, Sri Lanka] The food and feeding habits of two species of barbs, /Puntius bimaculatus/ (Bleeker) and /P. titteya/ Deraniyagala were studied. These two species co-occur in creeks leading to small streams at the foot-hills in most hilly areas of the country and are endemic to Sri Lanka. /P. bimaculatus/ was found to be predominantly an algal-detrital feeder while the other was more omnivorous in its feeding habits. There were significant differences in the diet of different size groups of any one species and the similarity in the diet of the two species was found to increase with increasing size. All size groups of both species are thought to exhibit selectivity in their diet. /P. bimaculatus/ was found to have a relatively longer gut and this is correlated to its diet; also the mean relative length of the gut was found to increase with increasing length. The gill rakers and pharyngeal teeth may also aid in dealing with ingested food material in /Puntius bimaculatus/.

78-001771 Doble, B. D.; Eggers, D. M. DIEL FEEDING CHRONOLOGY, RATE OF GASTRIC EVACUATION, DAILY RATION, AND PREY SELECTIVITY IN LAKE WASHINGTON JUVENILE SOCKEYE SALMON (/ONCORHYNCHUS NERKA/). Trans. Am. Fish. Soc. 107 (1): 36-45. Jan. 1978. SFA 23(3)
[Fish. Res. Inst., Univ. Wash., Seattle 98195]

78-001772 Farr, J. A. THE EFFECT OF METHYL PARATHION ON PREDATOR CHOICE OF TWO ESTUARINE PREY SPECIES. Trans. Am. Fish. Soc. 107 (1): 87-91. Jan. 1978. SFA 23(3)
[Inst. Biol., Inglostadter Landstrasse 1, D-8042, Neuherberg bei Munich, West Germany]

78-001773 Forester, J. S.; Avault, J. W., Jr. EFFECTS OF GRASS CARP ON FRESHWATER RED SWAMP CRAWFISH IN PONDS. Trans. Am. Fish. Soc. 107 (1): 156-160. Jan. 1978. SFA 23(3)
[Fish. Sect., Sch. For. Wildl. Manage., La. State Univ., Baton Rouge 70803]

78-001774 Gliwicz, Z. M.; Prejs, A. CAN PLANKTIVOROUS FISH KEEP IN CHECK PLANKTONIC CRUSTACEAN POPLUATIONS? A TEST OF SIZE-EFFECIENCY HYPOTHESIS IN TYPICAL POLISH LAKES. Ekol. Pol. 25 (4): 567-591. 1977. In English with Polish Summ. SFA 23(3)
[Dep. Hydrobiol., Inst. Zool. Univ. Warsaw, Warsaw, Poland]
Seasonal changes of food consumption rate of planktivorous fish (vendace, smelt and bleak) in two lakes with significantly different fish density, were compared with seasonal changes of (1) elimination of planktonic crustacean biomass, (2) mortality, (3) age structure in crustacean populations and (4) mean body weight of crustaceans. It was found that factors other than fish predation must be responsible for the seasonal and spatial changes of crustacean populations. This has been also confirmed by the results of an extensive analysis of zooplankton communities in 30 lakes with fish predation of varied intensity.

78-001775 Gorelova, T. A. SOME CHARACTERISTICS OF THE NUTRITION OF THE YOUNG OF NICTOEPIPELAGIC AND MESOPELAGIC LANTERN FISH (PISCES, MYCTOPHIDAE). Oceanology 17 (2): 220-222. Oct. 1977. SFA 23(3)
The contents of the stomachs and intestines of 1034 specimens of the young of the nictoepipelagic myctophids /Myctophum/, /Symbolophorus/, /Centrobranchus/, /Hygophum/, and /Gonichthys/ and 224 specimens of the myctophids /Lampanyctus/ and /Triphoturus/, collected in the equatorial part of the Pacific Ocean are analyzed. The ecological and morphophysiological differences between nictoepipelagic and mesopelagic myctophids are closely associated with differences in their nutrition. Feeding spectra, the sizes of consumed food, and the rhythms of feeding of the fish are examined. The adaptive meaning of the vertical migrations of these two groups of myctophids is discussed.

78-001776 Grabe, S. A. FOOD AND FEEDING HABITS OF JUVENILE ATLANTIC TOMCOD, /MICROGADUS TOMCOD/, FROM HAVERSTRAW BAY, HUDSON RIVER. NOAA Fish. Bull. 76 (1): 89-94. Jan. 1978. SFA 23(3)
[95 Ash St., Piermont, NY 10968] Juvenile Atlantic tomcod from Haverstraw Bay (Hudson River, N.Y.) were found to have a May-June diet of copepods and a July-December diet of amphipods, /Neomysis americana/, and isopods. This dietary shift occurred when mean length reached 90 mm during July. Growth paralleled feeding intensity: elevated during June, October, and November, and depressed July through September; feeding intensity decreased prior to spawning (December). Feeding and growth were inhibited at temperatures greater than 24°C and dissolved oxygen less than 7 mg/l.

78-001777 Graig, J. F. A STUDY OF THE FOOD AND FEEDING OF PERCH, /PERCA FLUVIATILIS/ L., IN WINDERMERE. Freshwater Biol. 8 (1): 59-68. Feb. 1978. SFA 23(3)

[Freshwater Biol. Assoc., The Ferry House, Far Sawrey, Ambleside, Cumbria LA22 0LP, England] Perch were sampled for their stomach contents at regular intervals throughout 24 h from June until October in 1973 and from February 1975 until January 1976. They were found to feed on benthic organisms from November until April, on benthos and plankton during May and June and on perch fry and zooplankton from July until October. Perch over a wide size range feed on similar prey. Fish showed great variability in the weight of their stomach contents. A method based on a points system was developed to estimate the weight of food in the stomach for a given weight of fish at a known time. A diel feeding pattern which varied with the season was apparent from these data. Rates of gastric evacuation were assumed to be exponential and were calculated from the drop in night-time stomach content weights when food intake was assumed to be zero. The rates ranged from 0.18 mg h^{-1} at a mean water temperature of 11°C in May to 0.35 mg^{-1} at a mean water temperature of 17°C in July. Assuming that food consumption followed a linear rate of intake, the standard Bajkov method was considered an adequate model to calculate daily food consumption.--From abstr.

78-001778 Guma'a, S. A. THE FOOD AND FEEDING HABITS OF YOUNG PERCH, /PERCA FLUVIATILIS/, IN WINDERMERE. Freshwater Biol. 8 (2): 177-187. Apr. 1978. SFA 23(3)

[Dep. Zool., Fac. Sci., Univ. Khartoum, Sudan] The food of 0+ perch, /Perca fluviatilis/ L. has been investigated in Windermere, the largest lake in the English Lake District. Whole guts and stomachs from 800 fish were investigated during four 24-h periods between June and September in 1975 and in 1976. Ciliates, algae, rotifers and cyclopoid nauplii constituted the first food of larval perch in Windermere. Vertical samples were taken from the zooplankton, at the same time and in the same location where the fish were sampled, and the concentration of the different food organisms studied. Electivity of the different food organisms was studied from Ivlev's index, which showed positive electivity, or selection for some organisms, e.g. /Bosmina obtusirostris/ (Sars.) and copepods (both cyclopoid and calanoid), and negative for others such as /Daphnia hyalina/ var. /galeata/ (Sars.), /Leptodora kindti/ (Focke) and /Bythotrephes longimanus/ (Leydig). In studying predator-prey relationships, /Daphnia hyalina/ was chosen as the 'standard prey', being the most abundant of all food organisms in the diet of young perch, also because its maximum body-depth (carapace width (mm)) was among the largest of the cladocera and copepods in Windermere. Comparison of the maximum carapace width of /Daphnia/ eaten with that of the plankton revealed that smaller specimens were taken by juvenile perch in July, but they tended to select larger organisms during August and September.

78-001779 Hobson, E. S.; Chess, J. R. TROPHIC RELATIONSHIPS AMONG FISHES AND PLANKTON IN THE LAGOON AT ENEWETAK ATOLL, MARSHALL ISLANDS. NOAA Fish. Bull. 76 (1): 133-153. Jan. 1978. SFA 23(3)

[NMFS, 3150 Paradise Drive, Tiburon, CA 94920]

78-001780 Hudson, W. F.; Bulow, F. J. SEASONAL VARIATIONS IN FOOD HABITS OF BURGESS FALLS LAKE BLUEGILLS. J. Tenn. Acad. Sci. 53 (2): 74. Apr. 1978. Abstract only. SFA 23(3)

[Tenn. Tech. Univ., Cookeville] Monthly stomach samples of bluegills (/Lepomis macrochirus/) were collected from Burgess Falls Lake, an impoundment of Falling Water River, from November 1976 through October 1977. Analysis of stomach contents revealed that a variety of acquatic invertebrates made up the major portion of the diet, but some terrestrial insects, plant material, fish eggs and mosquitofish (/Gambusia affinis/) were also consumed. Definite seasonal variations in total volume plus volumes and numbers of specific taxa were noted. Heavy predation on crappie eggs (/Pomoxis/ sp.) occurred in April. This food consumption data will be analyzed for possible correlations with growth data concurrently collected, including RNA-DNA ratios, liver weight indices, and condition factors.

78-001781 Ionova, V. A.; Payusova, A. N. FEATURES OF THE FEEDING OF JUVENILE CASPIAN ROACH (/RUTILUS RUTILUS CASPICUS/) IN ELEMENTARY POPULATIONS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 388-397. 1977. SFA 23(3)

[Biol. Fac., Moscow Univ., USSR] The feeding rate of the Caspian roach (/Rutilus rutilus caspicus/) in one elementary population is shown to be the same and to differ from that of members of different elementary populations. The daily ration of juveniles of one elementary population is the same at any point in the area occupied by it, but differs from that of fish of different elementary populations.

78-001782 Kozlova, M. P.; Panasenko, V. A. ANNUAL FOOD CONSUMPTION OF BREAM (/ABRAMIS BRAMA/) AND RUFFE (/ACERINA CERNUA/) POPULATIONS IN THE COURLAND LAGOON (KURSHSKIY ZALIV). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 382-388. 1977. SFA 23(3)

[Atl. Res. Inst. Fish. Oceanogr., Kaliningrad, USSR] The annual ration of a single bream is 988.1 kcal (or 2580.7 g), that of a single ruffe 37.3 kcal (or 129.3 g). The food coefficients decrease with the age of the fish and are on average respectively 13.4 for the bream and 18.1 for the ruffe. The bream makes more effective use of food than the ruffe. The annual consumption of forage organisms by the bream and ruffe populations in the Courland lagoon is approximately 83 thousand tons.--Concl.

78-001783 Kuznetsov, Ye. A. CONSUMPTION OF BACTERIA BY THE SILVER CARP (/HYPOPHTHALMICHTHYS MOLITRIX/). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 398-403. 1977. SFA 23(3)

[Dep. Ichthyol., Moscow Univ., USSR] Up to 80 percent of all the planktonic bacteria in ponds in which there is intensive polyculture of phytophagous fishes is in aggregates measuring more than 6 u; approximately 50 percent of all bacterial may be directly trapped by the filtering apparatus of the silver carp. It has been demonstrated under experimental conditons that the silver carp stabilizes the bacterioplankton at a level of 20-25 million cells per ml of water, primarily consuming large bacterial aggregates. Solitary bacteria and small aggregates may be concentrated on the slime secreted by the labyrithiform organ of the silver carp, and subsequently be ingested with the slime.--Concl.

78-001784 Lipskaya, N. Ya.; Gorbunova, N. N. FEEDING OF SAILFISH LARVAE. Oceanology 17 (3): 340-344. Dec. 1977. SFA 23(3)
The sailfish larvae change to predatory feeding when they are 6.0-8.0 mm long. They consume practically all larvae inhabiting the near-surface layer. Prey sizes reach 50-75 percent of the length of the predator. Feeding takes place in the daylight hours, with maximum consumption in the morning and evening. The duration of digestion of fish food is 4 hours. Daily food consumption amounts to 30-45 percent of the body mass of larvae weighing 10-130 mg, which is sufficient to cover the energy loss through metabolism (20-24 percent) and to provide high daily growth increments.

78-001785 Love, M. S.; Ebeling, A. W. FOOD AND HABITAT OF THREE SWITCH-FEEDING FISHES IN THE KELP FORESTS OFF SANTA BARBARA, CALIFORNIA. NOAA Fish. Bull. 76 (1): 257-271. Jan. 1978. SFA 23(3)
[Mar. Sci. Inst., Univ. Calif., Santa Barbara 93106] Diets and habitat distributions were compared among the blue rockfish, /Sebastes mystinus/, kelp bass, /Paralabrax clathratus/, and olive rockfish, /Sebastes serranoides/, all of which cooccur in areas of reef and giant kelp off Santa Barbara, Calif. The three species make up a feeding guild of large-mouthed predatory fishes that commonly switch among planktonic prey, nektonic prey (fish and squid), and substrate-oriented prey (invertebrates that live on or about reef and plant surfaces). At the semi-isolated study site, blue rockfish, which are somewhat better adapted than the others to ingest and retain small particles, ate relatively more plankton than did individuals of the other species, while olive rockfish ate more fish. Kelp bass had both the broadest diet and habitat distribution. All three species ate more plankton during winter-spring, yet had smaller dietary overlaps then. Olive rockfish ate more fish and less plankton at the heavily foliaged study site than they did over a deeper kelpless reef farther offshore. The three species tend toward deeper and calmer areas of the reef; kelp bass and olive rockfish prefer clear-water areas of dense kelp; kelp bass often concentrate near the outer kelp-bed margin; and both rockfishes prefer areas of high-relief rocky bottom. The morphologically similar kelp bass and olive rockfish may segregate spatially, perhaps reducing mutual interference. As inferred from other studies and our own, areal variation in feeding habits of the three species may reflect their environmental tolerances, range limits, numbers of competitors, food supplies, habitat structures, or predator densities. The closely related rockfishes show least dietary overlap between themselves and most overlap with the more distantly related kelp bass.

78-001786 Mikhman, A. S.; Tomanovich, L. V. THE FEEDING OF THE AZOV ANCHOVY, /ENGRAULIS ENCRASICHOLUS MAEOTICUS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 240-244. 1977. SFA 23(3)
[AzNIIRKh, Rostov-on-Don, USSR]

78-001787 Mok, H.-K. SCALE-FEEDING IN /TYDEMANIA NAVIGATORIS/ (PISCES: TRIACANTHODIDAE). Copeia 1978 (2): 338-340. 5 May 1978. SFA 23(3)
[Dep. Ichthyol., Am. Mus. Nat. Hist., New York, N.Y. 10024]

78-001788 Montgomery, W. L. MODIFICATION OF BENTHIC ALGAL COMMUNITIES BY GRAZING OF HERBIVOROUS FISH. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 353. July 1977. Abstract only. SFA 23(3)

[Dep. Zool., Ariz. State Univ., Tempe] /Microspathodon dorsalis/, a large territorial damselfish (Pomacentridae) from the lower Gulf of California, maintains a virtual monoculture of a species of the red algae /Polysiphonia/ (Rhodophyta) within its territory. External to these territories the rock substrate is covered by a multispecies algal turf composed primarily of fleshy and calcareous Red algae and fleshy Green algae (Chlorophyta). Exclusion of /M. dorsalis/ from territories is followed by a rapid increase in /Polysiphonia/ filament diameter and colonization by at least a dozen species of algae not recorded from the territory prior to excluding the fish. Grazing herbivorous fishes in the tropics exert, therefore, an important influence on the nature of algal communities via differing grazing. Low-intensity grazing allows a broad array of algae to successfully colonize a substrate. More intense grazing excludes all but one of two of the fastest-growing algal species in the community.

78-001789 Olatunde, A. A. THE FOOD AND FEEDING HABITS OF /EUTROPIUS NILOTICUS/ (RUPPELL), FAMILY SCHILBEIDAE (OSTEICHTHYES: SILURIFORMES) IN LAKE KAINJI, NIGERIA. Hydrobiologia 57 (3): 197-207. 15 Feb. 1978. SFA 23(3)

[Zool. Dep., Univ. Reading, Reading RG6 2AJ, England] Studies on the food and feeding habits of /Eutropius niloticus/ in Lake Kainji, Nigeria revealed that the fish is omnivorous but fed more on insects than on any other food. The most important insects were /Povilla adusta/ Navas nymphs and imagos and adults of the common grasshoppers. Fish, particularly the clupeids /Sierrathrissa leonensis/ Thys Van den Audernaerde and /Pellonula afzeliusi/ Johnels, also formed an important part of the diet. There was seasonal variation of organisms selected for food and there were variations in the dietary items selected by different age groups. Accumulation of fat was found to correlate with seasonal feeding intensity. /E. niloticus/ serves as food for other fishes.

78-001790 Paragamian, V. L. FOOD HABITS OF LARGEMOUTH BASS (/MICROPTERUS SALMOIDES/) AT BIG CREEK LAKE. Proc. Iowa Acad. Sci. 85 (1): 31-34. Mar. 1978. SFA 23(3)

[Manchester Fish Hatchery, RR 2, Box 269A, Manchester, IA 52057] Food habits of largemouth bass (/Micropterus salmoides) were studied at Big Creek Lake, from 1974-76, to determine the utilization of various prey species, temporal food habits, size at which bass became piscivorous, and size of fish-food items in relation to size of bass. Stomach contents from 259 bass were examined and 75 were empty. Entomostraca and insects were important food items of young bass but a transition stage was noted at about 125 mm TL when fish became the prominent food item. Crayfish were important food items early in the spring. Bass fed mostly on 0-age Centrarchids, and particularly bluegill and /Notropis/ sp. Fish provided 29 to 86 percent of the biomass consumed and 2 to 70 percent by number. Larger bass (300+ mm) tended to utilize larger but fewer fish-food items while smaller bass (200-299 mm) consumed smaller fish more frequently.

78-001791 Pedley, R. B.; Jones, J. W. THE COMPARATIVE FEEDING BEHAVIOUR OF BROWN TROUT, /SALMO TRUTTA/ L. AND ATLANTIC SALMON, /SALMO SALAR/ L. IN LLYN DWYTHWCH, WALES. J. Fish Biol. 12 (3): 239-256. Mar. 1978. SFA 23(3)
[Freshwater Fish. Unit, Univ. Liverpool, Liverpool L69 3BX, England] A detailed comparative study of the diets of natural brown trout and stocked Atlantic salmon in Llyn Dwythwch, North Wales, was carried out over a period of 13 months. The annual and seasonal composition of both diets was calculated by number, volume and occurrence methods. Food in relation to fish size was compared by Spearman rank correlation. Interspecific competition was only significant during the summer months when food was abundant. The bottom fauna was classified according to accessibility, and utilization of the fauna and electivity is discussed for each species. The similarity of diet between the salmon stocked into Llyn Dwythwch and those in Welsh rivers implies that the former is the result of inheritance rather than from interactive segregation with the lake trout.

78-001792 Peterman, R. M.; Gatto, M. ESTIMATION OF FUNCTIONAL RESPONSES OF PREDATORS ON JUVENILE SALMON. J. Fish. Res. Board Can. 35 (6): 797-808. June 1978. In English with French summ. SFA 23(3)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-001793 Pietsch, T. W. THE FEEDING MECHANISM OF /STYLEPHORUS CHORDATUS/ (TELEOSTEI: LAMPRIDIFORMES): FUNCTIONAL AND ECOLOGICAL IMPLICATIONS. Copeia 1978 (2): 255-262. 5 May 1978. SFA 23(3)
[Dep. Biol., Calif. State Univ., Long Beach 90840] The unique feeding mechanism of /Stylephorus chordatus/ depends on negative pressure created by the expansion of a membranous pouch that connects the cranium to an elongate, tubular mouth. Volume enlargement produced by this expansion may be as great as 38 times the volume of the closed buccal cavity. The tremendous, apparently rapid increase in volume provides for a high rate of water flow into the mouth cavity and thus an efficient sucking device for prey capture. Evidence is provided to indicate that /Stylephorus/ hangs, head-up in the water column, feeding on small planktonic organisms, mainly copepods.

78-001794 Power, G.; Gregoire, J. PREDATION BY FRESHWATER SEALS ON THE FISH COMMUNITY OF LOWER SEAL LAKE, QUEBEC. J. Fish. Res. Board Can. 35 (6): 844-850. June 1978. In English with French summ. SFA 23(3)
[Dep. Biol., Univ. Waterloo, Waterloo, ON N2L 3G1, Canada]

78-001795 Rogers, R. M., Jr. TROPHIC INTERRELATIONSHIPS OF SELECTED FISHES ON THE CONTINENTAL SHELF OF THE NORTHERN GULF OF MEXICO. Ph.D. dissertation, Tex. A&M Univ. 244p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8):3518. Feb. 1977. SFA 23(3)
The present study surveys the trophic interrelationships of 26 demersal fishes inhabiting the continental shelf of the northern Gulf of Mexico. Volumetric stomach content analyses were carried out on 4,550 specimens. A conceptual model of the trophic interrelationships in the benthic zone on the continental shelf is proposed. Two food chains are postulated: a planktonic chain involving conversion of energy fixed by phytoplankton to zooplankton for utilization by higer consumers, and a benthic chain involving conversion of energy fixed in organic detritus to detritus feeders for utilization by consumers in the sediment and eventually consumers in the water column. Zooplankton including larvae and juveniles of higher consumers is eaten largely by

78-001795 CONTINUED
small fishes and planktivorous adults. Eggs and larvae of many demersal fishes leave the benthic zone assuming a planktonic existence and escaping predation from this lower zone. Organic detritus enters the benthic food chain largely through assimilation by micro-bottom animals and benthic consumers as well as browsers from the water column. Larger macrocrustaceans and macromobile organisms readily utilize these benthic and pelagic browsers. Trophic energy is lost from the benthic zone to larger pelagic fishes acting as top predators.--From abstr.

78-001796 Roland, W. FEEDING BEHAVIOUR OF THE KELP CLINGFISH /RIMICOLA MUSCARUM/ RESIDING ON THE KELP /MACROCYSTIS INTEGRIFOLIA/. Can. J. Zool. 56 (4): 711-712. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Biol. Sci., Simon Fraser Univ., Burnaby, BC V5A 1S6, Canada] The feeding behaviour of the kelp clingfish /Rimicola muscarum/ Meek and Pierson residing on the blades of the kelp /Macrocystis integrifolia/ Bory was described. The fish seized small invertebrates, mainly harpacticoid copepods, which were closely associated with the kelp blades. A four-step food chain involving /R. muscarum/ was qualitatively determined. Diatoms epiphytic on the kelp blades were grazed by harpacticoid copepods. These and other small invertebrates were captured by the clingfish, which in turn was eaten by the black rockfish, /Sebastes melanops/, and the shiner perch, /Cymatogaster aggregata/.

78-001797 Ross, S. T. TROPHIC ONTOGENY OF THE LEOPARD SEAROBIN, /PRIONOTUS SCITULUS/ (PISCES: TRIGLIDAE). NOAA Fish. Bull. 76 (1): 225-234. Jan. 1978. SFA 23(3)
[Dep. Biol., Univ. South. Miss., South. Stn. Box 18, Hattiesburg 39401] Ontogenetic feeding changes of the leopard searobin, /Prionotus scitulus/, from Tampa Bay, Fla., showed a shift from planktonic and epifaunal prey in samll fish to infaunal prey in larger fish. Smaller fish utilized larval crustaceans, natantians, brachyurans, cumaceans, copepods, and gammarid amphipods while larger fish showed increasing reliance on the lancelet, /Branchiostoma floridae/. Biomass and linear dimensions of prey increased exponentially with fish size for larger fish, but were relatively constant for small fish. Relative prey biomass was lowest for intermediate-sized /P. scitulus/ (65-95 mm) and increased for both large and small predators so that small individuals were most similar to very large fish in terms of relative prey size. The switch to larger prey was preceded by rapid increases in mouth size and intestinal length, and was followed by attainment of minimum reproductive size and greater body weight per unit length. Spatial and trophic partitioning appear quite efficient in reducing potential intraspecific competition.

78-001798 Schramm, H. L., Jr. TEMPORAL ASPECTS OF FEEDING BEAHVIOR OF THE LARGEMOUTH BASS, /MICROPTERUS SALMOIDES SALMOIDES/ (LACEPEDE). Ph.D. dissertation, Univ. South. Ill. (Carbondale) 340p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(5):2076. Nov. 1977. SFA 23(3)
Comparison of estimated feeding intervals to gastrointestinal clearance rates indicated that neither an empty stomach nor an empty gastrointestinal tract were significant factors for elicitation of a feeding response by adult largemouth bass. Adult largemouth bass, 310-560 g, offered 5.5-10.6 cm TL bluegills or 3.7-13.5 g hybrid sunfish showed a statistically significant preference for the smaller sunfish forage. Feeding by the bass was primarily diurnal during 12/12 and natural L/D. Under L/D schedule of 24/0 the time of most feedings

78-001798 CONTINUED
corresponded to hours of daylight in the natural environment. Average daily ration ranged from 1.75-8.18 percent (mean = 3.2 percent) for individual bass in different trials. The average daily ration values in this study were similar to values observed in other studies of adult largemouth bass in laboratory and natural environments. Average daily ration was significantly higher at 24-25 C than at 18-19 C. There were significant differences in average daily ration in different seasons. Bass exposed to natural L/D showed significant differences in average daily ration in trials only 2-3 months apart; however, natural L/D conditions were not necessary for seasonal changes in average daily ration. For bass at 24-25 C and under L/D conditions of 12/12 or 24/0, average daily ration was highest in summer, lowest in winter, and higher in fall than in spring. Forage weight and L/D schedule had little effect on average daily ration. Whereas average daily ration was significantly higher at warmer water temperatures, growth rate was little affected. This implied that, at least for some bass, the increased average daily ration at warmer water temperatures was not sufficient to compensate for decreased efficiency of food conversion. Season significantly affected growth rate. A nutrient-based model is proposed which can account for both stimulation of feeding and seasonal and water temperature differences in average daily ration.--From abstr.

78-001799 Shireman, J. V.; Colle, D. E.; Rottmann, R. W. SIZE LIMITS TO PREDATION ON GRASS CARP BY LARGEMOUTH BASS. Trans. Am. Fish. Soc. 107 (1): 213-215. Jan. 1978. SFA 23(3)
[Sch. For. Resour. Conserv., Univ. Fla., Gainesville 32611]

78-001800 Simenstad, C. A.; Lipovsky, S. J. FISH FOOD HABITS STUDIES. Proc. First Pac. Northwest Tech. Workshop, Univ. Wash. Sea Grant Publ. WSG-WO-77-2. 193p. 1978. SFA 23(3)
[NMFS, Hammond, OR 97121] These proceedings represent a variety of subjects organized around five session topics: (1) Purpose and sampling design, (2) sampling of benthic predators and prey, (3) laboratory procedures and identification, (4) data manipulation and presentation, and (5) interpretation and results.

78-001801 Spataru, P.; Zorn, M. FOOD AND FEEDING HABITS OF /TILAPIA AUREA/ (STEINDACHNER) (CICHLIDAE) IN LAKE KINNERET (ISRAEL). Aquaculture 13 (1): 67-79. Jan. 1978. SFA 23(3)
[Fish Aquacult. Res. Stn., Dor, Israel] An analysis of the food of 274 specimens of /Tilapia aurea/ (Steindachner), which had been collected in Lake Kinneret, showed that this species is mainly a zooplankton consumer. A study of the quantitative dynamics of the food components in the course of a year has proved that the species in question feeds more intensely in spring, this being the time when zooplankton forms are more abundant in the water of the lake. Vegetable detritus, mixed with plankton and benthos forms, served as additional and alternative food. The lack of clearly positive degree of food component selectivity, as well as the low values of the intestine repletion index and of the condition coefficient, account for the slowness in growth of /Tilapia aurea/ in Lake Kinneret. The low values of the growth and feeding indices are due, according to the authors, to the pressure brought to bear by the other local fish species, which are competitors for the same food.

78-001802 Stein, R. A. SELECTIVE PREDATION, OPTIMAL FORAGING, AND THE PREDATOR-PREY INTERACTION BETWEEN FISH AND CRAYFISH. Ecology 58 (6): 1237-1253. 1977. SFA 23(3)
[Dep. Zool., Ohio State Univ., Columbus 43210]

78-001803 van der Westhuizen, H. C.; Marais, J. F. K. STOMACH CONTENT ANALYSES OF /POMADASYS COMMERSONNI/ FROM THE SWARTKOPS ESTUARY (PISCES: POMADASYIDAE). Zool. Afr. 12 (2): 500-504. 1977. SFA 23(3)
[Dep. Zool., Univ. Port Elizabeth, South Africa]

78-001804 Vinyard, G. L. AN ANALYSIS OF PREFERENCE AND ACCESSIBILITY AS DETERMINANTS OF PREY CHOICE BY THE BLUEGILL SUNFISH, (/LEPOMIS MACROCHIRUS/). Ph.D. dissertation, Univ. Kans. 79p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(7):3044. Jan. 1978. SFA 23(3)

78-001805 Virnstein, R. W. THE IMPORTANCE OF PREDATION BY CRABS AND FISHES ON BENTHIC INFAUNA IN CHESAPEAKE BAY. Ecology 58 (6): 1199-1217. 1977. SFA 23(3)
[Harbor Br. Found., RFD 1, Box 196, Fort Pierce, FL 33450]

78-001806 Zorbidi, Zh. Kh. DIURNAL FEEDING RHYTHM OF THE COHO SALMON, /ONCORHYNCHUS KISUTCH/, OF LAKE AZABACH'YE. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 166-168. 1977. SFA 23(3)
[KoTINRO, Petropavlovsk-Kamchatskiy, USSR]

AGE AND GROWTH

78-001807 Agor-Balicanta, A. PRELIMINARY REPORT ON THE GROWTH RATE OF THE GOBY. Philipp. J. Fish. 14 (2): 145-159. July-Dec. 1976. SFA 23(3)
[Bobon Seaweeds Minor Mar. Prod. Stn., Burgos, Ilocos Norte, Philippines]

78-001808 Berg, R. E. GROWTH AND MATURATION OF CHINOOK SALMON, /ONCORHYNCHUS TSHAWYTSCHA/, INTRODUCED INTO LAKE SUPERIOR. Trans. Am. Fish. Soc. 107 (2): 281-283. Mar. 1978. SFA 23(3)
[Milwaukee Publ. Mus., Milwaukee, WI 53233]

78-001809 Broughton, N. M.; Jones, N. V. AN INVESTIGATION INTO THE GROWTH OF 0-GROUP ROACH, (/RUTILUS RUTILUS/ L.) WITH SPECIAL REFERENCE TO TEMPERATURE. J. Fish Biol. 12 (4): 345-357. Apr. 1978. SFA 23(3)
[Severn-Trent Water Authority, Meadow Lane, Nottingham NG2 3HN, England] The growth of 0-group roach in a chalk-fed river is traced over six seasons and the growth compared to that in a nearby gravel pit. The growth rate, the daily weight increase and the condition of the fish are all highest during the summer, falling to a minimum over the winter period and rising again in the spring. Considerable yearly variation in the growth of roach in the river was observed and correlated with water temperatures above 14° C. It is suggested that water temperature, acting through the food supply, is the dominant factor governing growth. The hot summer of 1976 appears to have resulted in excellent growth of roach in both habitats.

78-001810 Bulow, F. J.; Heitman, J. F. METHODS OF ESTIMATING TIME OF ANNULUS FORMATION ON FISH SCALES. J. Tenn. Acad. Sci. 53 (2): 74. Apr. 1978. Abstract only. SFA 23(3)
[Tenn. Tech. Univ., Cookeville] An essential aspect of the scale method for determing age and growth characteristics of a fish population is the recognition of the annulus or year mark. This paper presents two methods for determining if the annulus of the current year is present and two methods for estimating the date of annulus formation. Annulus formation, reflecting onset of active feeding and growth, generally occurs earlier in southern latitudes due to the influence of temperature and photoperiod. Data are presented for bluegills (/Lepomis macrochirus/) from three Tennesse lakes at approximately latitude 36°N.

78-001811 Chapman, D. W.; van Well, P. GROWTH AND MORTALITY OF /STOLOTHRISSA TANGANICAE/. Trans. Am. Fish. Soc. 107 (1): 26-35. Jan. 1978. SFA 23(3)
[FAO of the UN, Apartado Aereo 2459, Cartagena, Colombia]

78-001812 Epperly, S. P.; Creekmore, R. C.; Tarter, D. C. AGE AND GROWTH OF THE CHANNEL CATFISH, /ICTALURUS PUNCTATUS/, FROM THE OHIO RIVER. Proc. W. Va. Acad. Sci. 50 (1): 24. 1978. Abstract only. SFA 23(3)
[Dep. Biol. Sci., Marshall Univ., Huntington, WV 25701] Age and growth of /Ictalurus punctatus/ (Rafinesque) collected from the Ohio River were determined to compare populations with those of Oklahoma, Iowa, Tennessee and other areas. From November 1976 to May 1977, 152 fish were taken from six collections. Pectoral spines were sectioned and read for number of annuli. A length-weight relationship shows: Ln Weight = -6.2143 + 3.3984 Ln Length. The population grows faster than most areas until age five. It decreases comparably in growth rate with increased age greater than eight.--From abstr.

78-001813 Gjedrem, T.; Gunnes, K. COMPARISON OF GROWTH RATE IN ATLANTIC SALMON, PINK SALMON, ARCTIC CHAR, SEA TROUT AND RAINBOW TROUT UNDER NORWEGIAN FARMING CONDITIONS. Aquaculture 13 (2): 135-141. Feb. 1978. SFA 23(3)
[Dep. Anim. Genet. Breeding, Agric. Univ. Norway, 1432 As-NLH, Norway] Growth rates of Atlantic salmon, pink salmon, Arctic char, sea trout and rainbow trout were compared under Norwegian farming conditions. During the juvenile, freshwater period, growth was fastest in pink salmon, followed by rainbow trout and Arctic char. Freshwater growth of sea trout and, especially, Atlantic salmon, was slow. After transfer of smolts or fingerling to sea water, Arctic char failed to survive the autumn. Seawater growth of sea trout was slow, but the three species, rainbow trout, Atlantic salmon and pink salmon, all grew rapidly through all seasons. When in sea water, rainbow trout and pink salmon were regularly attacked by vibriosis, while Atlantic salmon were rarely attacked, and sea trout never. It is concluded that, for commercial farming in Norway, rainbow trout are of value for production of fish of any size up to 3-4 kg, and pink salmon for production of small fish of 0.5-1.5 kg. Atlantic salmon is the only species suitable for production of a very large salmonid, i.e., more than 4-5 kg.

78-001814 Hecht, T. A NOTE ON PHOTOGRAPHING OTOLITHS. Zool. Afr. 12 (2): 497. 1977. SFA 23(3)
[Dep. Zool., Univ. Port Elizabeth, South Africa]

78-001815 Inoue, H. EFFECTS OF WATER TEMPERATURE AND BODY SIZE ON GROWTH RATE OF JUVENILE YELLOWTAIL, /SERIOLA QUINQUERADIATA/, CULTURED IN JAPAN. Tech. Bull. Fac. Agric. Kagawa Univ. 29 (2): 305-321. Mar. 1978. In English with Japanese summ. SFA 23(3)

78-001816 Kesler, D. H. WEIGHT-LENGTH REGRESSIONS AND GROWTH FOR TWO BLUEGILL POPULATIONS IN RHODE ISLAND. Prog. Fish-Cult. 40 (2): 46-47. Apr. 1978. SFA 23(3)
[Div. Biol. Sci., Univ. Mich., Ann Arbor 48109]

78-001817 Knudsen, E. E.; Herke, W. H. GROWTH RATE OF MARKED JUVENILE ATLANTIC CROAKERS, /MICROPOGON UNDULATUS/, AND LENGTH OF STAY IN A COASTAL MARSH NURSERY IN SOUTHWEST LOUISIANA. Trans. Am. Fish. Soc. 107 (1): 12-20. Jan. 1978. SFA 23(3)
[U.S. FWS, 2625 Parkmont Lane, Olympia, WA 98502]

78-001818 Kunjipalu, K. K. A RECORD OF AN UNUSUALLY LARGE SPECIMEN OF /LACTARIUS LACTARIUS/ (SCHNEIDER). Indian J. Fish. 22 (1,2): 294. 1975. SFA 23(3)
[Veraval Res. Cent. C.I.F.T., Veraval, India]

78-001819 Manooch, C. S. III; Haimovici, M. AGE AND GROWTH OF THE GAG, /MYCTEROPERCA MICROLEPIS/, AND SIZE-AGE COMPOSITION OF THE RECREATIONAL CATCH OFF THE SOUTHEASTERN UNITED STATES. Trans. Am. Fish. Soc. 107 (2): 234-240. Mar. 1978. SFA 23(3)
[NMFS, Beaufort, NC 28516]

78-001820 Olmsted, L. L.; Kilambi, R. V. AGE AND GROWTH OF SPOTTED BASS (/MICROPTERUS PUNCTALATUS/) IN LAKE FORT SMITH, ARKANSAS. Trans. Am. Fish. Soc. 107 (1): 21-25. Jan. 1978. SFA 23(3)
[Duke Power Co. Environ. Lab., Rt. 3, Box 90, Huntersville, NC 28078]

78-001821 Proviz, L. I. A DEVICE FOR THE PREPARATION OF FISH SCALE IMPRESSIONS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 341-343. 1977. SFA 23(3)
[Limnol. Inst., USSR Acad. Sci., Listvenichnoye Settlement, Irkutsk Province, USSR]

78-001822 Rasachandra Kartha, K. N. GROWTH RATE IN /LACTARIUS LACTARIUS/ (SCHNEIDER) AT KARWAR. Indian J. Fish. 22 (1,2): 284-286. 1975. SFA 23(3)
[Cent. Mar. Fish. Res. Inst., Cochin-18, India]

78-001823 Redmon, W. L.; Krumholz, L. A. AGE, GROWTH, CONDITION, AND MATURITY OF SUNFISHES OF DOE RUN, MEADE COUNTY, KENTUCKY. Trans. Ky. Acad. Sci. 39 (1-2): 60-73. Mar. 1978. SFA 23(3)
[U.S. EPA, Region V, Chicago, IL 60604]

78-001824 Robinette, J. R.; Morgan, E. L. LENGTH-WEIGHT RELATIONSHIP IN BROOK TROUT /SALVELINUS FONTINALIS/ (MITCHILL) OF THE GREAT SMOKY MOUNTAINS NATIONAL PARK. J. Tenn. Acad. Sci. 53 (2): 74. Apr. 1978. Abstract only. SFA 23(3)
[Tenn. Tech. Univ., Cookeville] The Length-weight relationship was calculated for 318 brook trout taken from five different streams in the Park. Each fish was weighed to the nearest gram and measured to the nearest millimeter. Data was employed in an SPSS computer program to plot and display separately actual and calculated weight over length. The slope of the regression line for the actual weights was .58. The calculated confidence limits were 93.31 percent with a standard error of 9.14. Confidence limits for calculated weights were 97.06 percent with a standard error of 5.55. The slope of the regression line was .55. These comparisons show a definite relationship between length and weight, and that the calculated length-weight relationship is a reasonable model for predicting the weight of brook trout in the Park.

78-001825 Savvatimskiy, P. I.; Kokh, Kh.; Yernst, P. COMPARISON OF METHODS FOR DETERMINING THE AGE OF GRENADIERS (MACRURIFORMES, PISCES) FROM THE NORTHERN ATLANTIC. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 324-327. 1977. SFA 23(3)
[PINRO, Murmansk, USSR]

78-001826 Sinoda, M.; Intong, S. SIZE FREQUENCY DISTRIBUTION OF LIZARD FISH, /SAURIDA UNDOSQUAMIS/, IN THE INNER GULF OF THAILAND. Bull. Jpn. Soc. Sci. Fish. 44 (1): 1-6. Jan. 1978. SFA 23(3)
[17-6 Yukinaga Higashi-Macki, Maizuru City, Kyoto, Japan]

78-001827 Vasil'kov, V. P. THE INFORMATION-RECORDING PROPERTIES OF THE SCALES OF THE NEW ZEALAND JACKASSFISH (/CHEILODACTYLUS MACROPTERUS/) AND THEIR USE TO OBTAIN INFORMATION ON GROWTH RHYTHMS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 375-381. 1977. SFA 23(3)
[TINRO, Vladivostok, USSR] The scales of the jackassfish (/Cheilodactylus macropterus/) were examined in relation to: the way in which fluctuations in the growth of fish are reflected in the size of the sclerites and the distance between sclerites; the information content of the various size characteristics in relation to annual growth rhythms and growth rhythms of different periods; measurement and analysis conditions that increase the accuracy with which rhythms are distinguished, and alteration in the information content of previously deposited scale layers under the influence of subsequently deposited layers.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

78-001828 Abbakumov, V. P. THE INITIAL STAGE IN FORMATION OF THE FISH FAUNA IN THE RESERVOIRS OF THE IRTYSH-KARAGANDA CANAL. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 357-363. 1977. SFA 23(3)
[KazNIIRKh, Balkhash, USSR] Consideration is given to the composition of the fish fauna and to the initial stage of its formation in the reservoirs of the Irtysh-Karaganda canal. It is emphasized that there is a need for fish culture and acclimatization with the object of reconstructing the fish fauna of these waters.

78-001829 Abbott, T. M.; Dickson, K. L.; Potter, W. A. /NOTROPIS CERASINUS/ (COPE) RECORD FROM THE APPOMATTOX RIVER DRAINAGE. Va. J. Sci. 28 (4): 167-168. 1977. SFA 23(3)
[Cent. Environ. Stud., VPI&SU, Blacksburg, VA 24061]

78-001830 Amaoka, K.; Toyoshima, M.; Sasaki, T. FIRST RECORD OF /BRYOZOICHTHYS LYSIMUS/ FROM JAPAN AND SECOND RECORD OF /B. MAJORIUS/ FROM ALEUTIAN ISLANDS AND GULF OF ALASKA. Bull. Fac. Fish. Hokkaido Univ. 28 (4): 175-180. Nov. 1977. SFA 23(3)
[Lab. Mar. Zool., Fac. Fish., Hokkaido Univ., Japan]

78-001831 Barton, M. FIRST OREGON RECORDS FOR TWO BLENNIOID FISHES. Calif. Fish Game 64 (1): 60. Jan. 1978. SFA 23(3)
[Dep. Fish. Wildl., Oreg. State Univ., Corvallis 97331]

78-001832 Basham, L.; Gilbreath, L. UNUSUAL OCCURRENCE OF PINK SALMON (/ONCORHYNCHUS GORBUSCHA/) IN THE SNAKE RIVER OF SOUTHEASTERN WASHINGTON. Northwest Sci. 52 (1): 32-34. Feb. 1978. SFA 23(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] The first positively identified adult pink salmon (/Oncorhynchus gorbuscha/) is reported for the Snake River of Southeastern Washington State. The sightings were in the Tucannon River and at Little Goose and Lower Granite Dams, approximately 625 to 694 km from the Pacific Ocean. Spent female pink salmon carcasses indicated that these fish can migrate long distances and arrive in time to spawn.

78-001833 Berrien, P. L. EGGS AND LARVAE OF /SCOMBER SCOMBRUS/ AND /SCOMBER JAPONICUS/ IN CONTINENTAL SHELF WATERS BETWEEN MASSACHUSETTS AND FLORIDA. NOAA Fish. Bull. 76 (1): 95-115. Jan. 1978. SFA 23(3)
[NMFS, Sandy Hook Lab., Highlands, NJ 07732] Larval /Scomber scombrus/ and /Scomber japonicus/ from the western North Atlantic Ocean are compared. At 4 to 11 mm /S. japonicus/ are deeper bodied, and at 3 to 15 mm have greater preanus lengths than /S. scombrus/ of comparable sizes. /Scomber scombrus/ larvae are more heavily pigmented than /S. japonicus/, particularly on the dorsal trunk surface and at the cleithral sympysis. In continental shelf waters between Martha's Vineyard, Mass., and Palm Beach, Fla. 1966-68, /S. scombrus/ eggs occurred north of Cape Hatteras, N.C., mostly in the shoreward half of shelf waters, during spring and summer. Surface temperatures associated with egg occurrences varied from 6.3° to 16.9°C. /Scomber japonicus/ eggs were taken south of Cape Hatteras, in the outer half of shelf waters, during winter and spring cruises. Surface temperatures associated with egg occurrences ranged from 20.4° to 25.4°C. Larval /S. scombrus/ occurred north of Cape Hatteras during

78-001833 CONTINUED
spring and summer with concurrent surface temperatures ranging from 12.3° to 20.7°C. With the exception of three specimens, /S. japonicus/ larvae occurred south of Cape Hatteras and were taken where the surface temperature ranged from 16.0° to 29.4°C.

78-001834 Berry, D. K. NORTHERN RANGE EXTENSION FOR THE BRASSY MINNOW IN NORTHEASTERN ALBERTA. Can. Field-Nat. 91 (4): 402-403. Oct.-Dec. 1977. SFA 23(3)
[Fish Wildl. Div., Alberta Dep. Recreation Parks Wildl., Edmonton, AB T6H 4P2, Canada]

78-001835 Bich, J. P.; Scalet, C. G. FISHES OF THE LITTLE MISSOURI RIVER, SOUTH DAKOTA. Proc. S. D. Acad. Sci. 56: 163-177. 1977. SFA 23(3)
[Dep. Wildl. Fish. Sci., S. Dak. State Univ., Brookings 57006] Objectives of this study were to determine the distribution and relative abundance of the fish species found in the South Dakota portion of the Little Missouri River. Twenty-five collection sites were visited, and 48 collections made during May, June and July, 1976. All sampling was done using seines. Twenty-two species were collected during the study. Previous reports listed 20 species from all of the Little Missouri River and 16 species from the South Dakota portion of the river. New species reported for the Little Missouri River were northern pike, /Esox lucius/, golden shiner, /Notemigonus crysoleucas/, largemouth bass, /Micropterus salmoides/, and Iowa darter, /Etheostoma exile/. The sturgeon chub, /Hybopsis gelida/, green sunfish, Lepomis cyanellus/, and sauger, /Stizostedion canadense/, were new records for the river in South Dakota.

78-001836 Binderim, G. E. FISHES OF MILL CREEK, A TRIBUTARY OF THE WASHITA RIVER, JOHNSTON AND MURRAY COUNTIES, OKLAHOMA. Proc. Okla. Acad. Sci. 57: 1-11. 1977. SFA 23(3)
[1702 University Ave., Monroe, LA 71203] A survey of the fishes of Mill Creek was conducted from January, 1974 to September, 1975. A total of 20,862 specimens was taken in 53 collections made at 27 stations. This survey established the pressence of 12 families and 46 species in Mill Creek. The horizontal distribution of the ichthyofauna is discussed. The occurrence of one species and the first published collection site for another is reported for the first time above Denison Dam in the Washita River system.

78-001837 Bounds, S. V.; Beadles, J. K.; Johnson, B. M. FISHES OF RANDOLPH COUNTY, ARKANSAS. Proc. Ark. Acad. Sci. 31: 21-25. 1977. SFA 23(3)
[Dep. Sci., Crawley's Ridge Coll., Paragould, AR 72450] A survey of the fishes of Randolph County in northcentral Arkansas was made between June 1973 and March 1977. Field collections, literature records, and museum specimens revealed the ichthyofauna of Randolph County to be composed of 128 species distributed among 24 families. Cyprinidae was the largest family, being represented by 34 species while Percidae was represented by 24 species. Randolph County is composed of Ozark Uplands and Coastal Plain areas. All of the stream systems flow into the Black River system with the exception of Village Creek in the southeastern corner of the county which flows into White River. The major streams in the county are Black, Current, Eleven Point, Fourche, and Spring Rivers, and Jane's Creek.

78-001838 Cadwallader, P. L. J. O. LANGTRY'S 1949-50 MURRAY RIVER INVESTIGATIONS. Victoria Fish. Wildl. Pap. No. 13. 70p. Sept. 1977. SFA 23(3)
[Fish. Wildl. Div., 250 Victoria Parade, East Melbourne, Victoria, Australia 3002]

78-001839 Conner, J. V. ZOOGEOGRAPHY OF FRESHWATER FISHES IN WESTERN GULF SLOPE DRAINAGES BETWEEN THE MISSISSIPPI AND THE RIO GRANDE. Ph.D. dissertation, Tulane Univ. 280p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(4):1601. Oct. 1977. SFA 23(3)

78-001840 Echelle, A. A.; Hubbs, C. STATE PARK SPRING: HAVEN FOR ENDANGERED PUPFISH. Tex. Parks Wildl. 36 (6): 9-11. June 1978. SFA 23(3)
[Dep. Biol., Baylor Univ., Waco, TX]

78-001841 Emery, A. R.; Teleki, G. EUROPEAN FLOUNDER (/PLATICHTHYS FLESUS/) CAPTURED IN LAKE ERIE, ONTARIO. Can. Field-Nat. 92 (1): 89-91. Jan.-Mar. 1978. SFA 23(3)
[R. Ont. Mus., 100 Queen's Park, Toronto, ON M5S 2C6, Canada] Two specimens of /Platichthys flesus/, the flounder, from Europe, were captured alive in different localities in Lake Erie, far from the fish's normal oceanic or estuarine habitat. Evidence from stomach contents suggested some residence time in the lake and immigration is speculated to have been via a ship's ballast tank.

78-001842 Fay, R. C.; Vallee, J. A.; Brophy, P. AN ANALYSIS OF FISH CATCHES OBTAINED WITH AN OTTER TRAWL IN SANTA MONICA BAY, 1969-73. Calif. Fish Game 64 (2): 104-116. Apr. 1978. SFA 23(3)
[Pac. Bio-Mar. Lab., Inc., P.O. Box 536, Venice, CA 90291]

78-001843 Fitch, J. E.; Schultz, S. A. SOME RARE AND UNUSUAL OCCURRENCES OF FISHES OFF CALIFORNIA AND BAJA CALIFORNIA. Calif. Fish Game 64 (2): 74-92. Apr. 1978. SFA 23(3)
[Calif. Dep. Fish Game, Sacramento]

78-001844 Frazier, G. C.; Beadles, J. K. THE FISHES OF SYLAMORE CREEK, STONE COUNTY, ARKANSAS. Proc. Ark. Acad. Sci. 31: 38-41. 1977. SFA 23(3)
[Jonesboro High School, Jonesboro, AR] A survey of the fishes of Sylamore Creek in northcentral Arkansas yielded a total of 15,041 specimens representing 44 species, including one hybrid, distributed among 11 families. The three most abundant fishes collected were: /Notropis pilsbryi/ Fowler, /Dionda nubila/ (Forbes), and /Notropis telescopus/ (Cope), respectively. Two species, /Campostoma anomalum pullum/ (Agassiz), and /N. pilsbryi/, were collected at every station. Sylamore Creek is a clear predominantely spring-fed stream that originates in the Ozark Mountains of northcentral Arkansas and empties into the White River 72.3 km above Batesville. Sylamore Creek is composed of two branches, North and South Sylamore, which comprise the bulk of the watershed. Both branches flow through extremely rugged and scenic country before joining to form Sylamore Creek proper. After the confluence of both branches, the Creek flows 0.8 km before emptying into the White River at Allison, Arkansas.

78-001845 Frederikhsen, A. V. IDENTIFICATION OF SPECIES OF THE GENUS /SEBASTES/ FROM BONES FOUND IN THE STOMACH OF THE SPERMWHALE (/PHYSETER CATADON/). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 483-487. 1977. SFA 23(3)
[Zool. Inst., USSR Acad. Sci., Ieningrad, USSR]

78-001846 Fulmer, R. F.; Harp, G. L. THE FISHES OF CROWLEY'S RIDGE IN ARKANSAS. Proc. Ark. Acad. Sci. 31: 42-45. 1977. SFA 23(3)
[Div. Biol., Ark. State Univ., State University 72467] Crowley's Ridge is one of the six natural geographic divisions of Arkansas which rises out of the Mississippi embayment as a relatively steep, uncultivated loessial mass. The ridge is drained by a network of headwater streams which are relatively clear with alkaline pH values and uniformly low alkalinity values. Carbon dioxide values were moderate and oxygen values were adequate. The fish species collected were basically headwater in composition. Isolated groups of characteristically upland species indicate that environmental quality of adjacent deltaic streams was better at one time.

78-001847 Guillory, V.; Gasaway, R. D. ZOOGEOGRAPHY OF THE GRASS CARP IN THE UNITED STATES. Trans. Am. Fish. Soc. 107 (1): 105-112. Jan. 1978. SFA 23(3)
[Fla. Game Fresh Water Fish Comm., Eustes 32726]

78-001848 Icanberry, J. W.; Warrick, J. W.; Rice, D. W., Jr. SEASONAL LARVAL FISH ABUNDANCE IN WATERS OFF DIABLO CANYON, CALIFORNIA. Trans. Am. Fish. Soc. 107 (2): 225-233. Mar. 1978. SFA 23(3)
[Dep. Eng. Res., Pac. Gas Elec. Co., San Ramon, CA 94583]

78-001849 James, B.; Williams, D.; Sliger, W. A. THE FISHES OF INDIAN CREEK, OBION COUNTY, TENNESSEE. J. Tenn. Acad. Sci. 53 (2): 75. Apr. 1978. Abstract only. SFA 23(3)
[Univ. Tenn., Martin]

78-001850 Jayaprakash, A. A. A RECORD OF /NIBEA CHUI/ TREWAVAS FROM INDIA. Indian J. Fish. 22 (1,2): 259-261. 1975. SFA 23(3)
[Bombay Res. Cent. C.M.F.R. Inst, Bombay, India]

78-001851 Johnson, B. M.; Beadles, J. K. FISHES OF THE ELEVEN POINT RIVER WITHIN ARKANSAS. Proc. Ark. Acad. Sci. 31: 58-61. 1977. SFA 23(3)
[Div. Biol. Sci., Ark. State Univ., State University 72467] A survey of the fishes of the Eleven Point River and its tributaries was made between 31 January 1976 and 13 February 1977. Sixty-three collections, literature records and personal communications revealed 90 species distributed among 19 families. This study revealed 31 species previously not reported for this river system. The Eleven Point River is a clear, predominantly springfed Ozark stream which is located in western Randolph County. From the Arkansas-Missouri state line, the Eleven Point River flows south for Approximately 64 km before joining the Spring River. Terrain in the Arkansas portion of this river is rugged as the river meanders throuigh the Salem Plateau of the Ozark Mountains.

78-001852 Jones, G. S.; Schleuter, R. A. SOME FISHES FROM SULLIVAN COUNTY, INDIANA. Indiana Audubon Q. 56 (1): 12-14. Feb. 1978. SFA 23(3)
[Dep. Biol., Northeastern Univ., Boston, MA]

78-001853 Keirans, W. J., Jr. AN IMMUNOCHEMICALLY ASSISTED ICHTHYOPLANKTON SURVEY WITH ELABORATION ON SPECIES SPECIFIC ANTIGENS OF FISH EGG VITELLINS; SOUTHERN NEW JERSEY BARRIER ISLAND-LAGOON COMPLEX. Ph.D. dissertation, Lehigh Univ. 169p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(4):1515. Oct. 1977. SFA 23(3)

78-001854 Kensley, B. F.; Penrith, M. J. BIOLOGICAL SURVEY OF SANDVIS 1, INTRODUCTION AND FAUNAL LIST. Madoqua 10 (3): 181-190. 1977. SFA 23(3)
[South African Mus., Cape Town, South Africa] The topography of Sandvis is briefly introduced and changes in the area, based on charts, described. These show that the area has evolved, within 90 years, from an open harbour, suitable for large craft, to an almost completely landlocked generally shallow lagoon. A faunal list of the aquatic and marinal fauna is given. Excluding the planktonic component a total of 93 invertebrate and 25 vertebrates are recorded.

78-001855 Khan, M. Z. ON THE SUNFISH, /MOLA MOLA/ (L) A NEW RECORD FROM INDIAN WATERS. Indian J. Fish. 22 (1,2): 295-296. 1975. SFA 23(3)
[Bombay Res. Cent. C.M.F.R. Inst., Bombay, India]

78-001856 Knaggs, E. H. STATUS OF THE GENUS /TILAPIA/ IN CALIFORNIA'S ESTUARINE AND MARINE WATERS. Cal-Neva Wildl. Trans. 1977: 60-67. 1977. Copies Available from The Wildlife Society, 4606 San Marino Drive, Davis, CA 95616. SFA 23(3)
[Calif. Dep. Fish. Game, Long Beach] Breeding populations of /Tilapia mossambica/ are now established in southern California marine and estuarine waters. /Tilapia zillii/ has been collected twice in the marine environment. Survival in the marine environment, establishment of populations, geographic ranges, and the possible effect on other species are discussed.

78-001857 Konchina, Yu. V. THE SYSTEMATICS AND DISTRIBUTION OF THE GRUNT FAMILY (POMADASYIDAE). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (6): 883-900. 1976. SFA 23(3)
[VNIRO, Moscow, USSR]

78-001858 Krupitskiy, Yu. G.; Ustyugov, A. F. THE PINK SALMON, /ONCORHYNCHUS GORBUSCHA/, IN THE RIVERS OF THE NORTH OF KRASNOYARSK TERRITORY. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 320-322. 1977. SFA 23(3)
[Yenisey Fish Hatchery, Krasnoyarsk, USSR]

78-001859 Leithiser, R. M. THE SEASONAL ABUNDANCE AND DISTRIBUTION OF LARVAL FISHES IN ANAHEIM BAY, CALIFORNIA. M.A. thesis, Calif. State Univ. (Long Beach) 144p. 1977. From Masters Abstracts 16(1), Mar. 1978. SFA 23(3)

The distribution and abundance of larval fishes in Anaheim Bay was investigated based on biweekly surface plankton samples collected at night at six stations. A total of 6,998 larvae consisting of 22 forms were collected. Larvae of four gobiid species, /Clevelandia ios/, /Gillichthys mirabilis/, /Ilypnus gilberti/, and /Quietula y-cauda/, were abundant and together comprised over 83 percent of the total catch. Atherinid, engraulid, sciaenid type one, and /Hypsoblennius/ species were seasonally abundant at certain stations and comprised 8.23, 4.50, 1.90, and 1.51 percent of the total catch, respectively. Gobiids and atherinids were collected primarily in the salt marsh, while /Hypsoblennius/ sp. was most abundant in the outer harbor; sciaenid type one and engraulid larvae were most common in the main channels outside of the salt marsh. Total larval density was greatest from late February through late June; density values were far higher than those reported for other shallow inshore areas.

78-001860 Lindquist, D. G.; Shute, J. R.; Shute, P. W. RECORD OF BLUEFIN KILLIFISH, /LUCANIA GOODEI/, IN NORTH CAROLINA. J. Elisha Mitchell Sci. Soc. 93 (1): 19-20. 1977. SFA 23(3)

[Dep. Biol., Univ. N. Car., Wilmington 28401]

78-001861 Mattson, C. R.; Wing, B. L. ICHTHYOPLANKTON COMPOSITION AND PLANKTON VOLUMES FROM INLAND COASTAL WATERS OF SOUTHEASTERN ALASKA, APRIL-NOVEMBER 1972. NOAA Tech. Rep. NMFS SSRF- 723. iii + 11p. Apr. 1978. SFA 23(3)

[NMFS, P.O. Box 155, Auke Bay, AK 99821]

78-001862 McCaffrey, P. M. STUDIES ON THE COMPOSITION AND ORGANIZATION OF THE DEMERSAL ICHTHYOFAUNA OF THE CONTINENTAL SHELF ZONE IN THE NORTHEASTERN GULF OF MEXICO. Ph.D. dissertation, Fla. State Univ. 626p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(9): 4002.

78-001863 Mushacke, F. M.; Fallon, D. J. FIRST RECORD OF THE SERGEANT MAJOR FROM NEW YORK WATERS. N.Y. Fish Game J. 25 (1): 85-86. Jan. 1978. SFA 23(3)

[N.Y. State Dep. Environ. Conserv., Albany]

78-001864 Muthu, M. S.; Narasimham, K. A.; Sudhakara Rao, G.; Appanna Sastry, Y.; Ramalingam, P. ON THE COMMERCIAL TRAWL FISHERIES OFF KAKINADA DURING 1967-70. Indian J. Fish. 22 (1,2): 171-186. 1975. SFA 23(3)

[Kakinada Res. Cent. C.M.F.R. Inst., Kakinada-2, India]

78-001865 Nakamura, I.; Nakano, S. DISPERSAL OF THE SHORTBILL SPEARFISH, /TETRAPTURUS ANGUSTIROSTRIS/, TO THE ATLANTIC OCEAN. Copeia 1978 (2): 330-333. 5 May 1978. SFA 23(3)

[Fish. Res. Stn., Kyoto Univ., Maizuru, Kyoto 625, Japan]

78-001866 Nelson, J. S. RECORDS OF A NEW FORM OF THE MARINE COTTID FISH /ANTIPODOCOTTUS GALATHEAE/ FROM THE EAST COAST OF NEW ZEALAND. Natl. Mus. N.z. Records 1 (4):80-86. 22 Dec. 1975. SFA 23(3)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E1, Canada]

78-001867 Nizovtsev, G. P.; Ponomarenko, V. P.; Shevelev, M. S. DEEPSEA FISHES OF THE NORWEGIAN SEA. J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.) 16 (6): 1013-1014. 1976. SFA 23(3)
[PINRO, Murmansk, USSR]

78-001868 Oxley, D. J.; Humphreys, G. B. OCCURRENCE OF THE GREEN SUNFISH (/LEPOMIS CYANELLUS/) IN THE GRAND RIVER SYSTEM. Can. Field-Nat. 91 (4): 424-426. Oct.-Dec. 1977. SFA 23(3)
[Dep. Biol., Wilfrid Laurier Univ., Waterloo, ON N2L 3C5, Canada]

78-001869 Pflieger, W. L. DISTRIBUTION AND STATUS OF THE GRASS CARP (/CTENOPHARYNGODON IDELLA/) IN MISSOURI STREAMS. Trans. Am. Fish. Soc. 107 (1): 113-118. Jan. 1978. SFA 23(3)
[Fish Wildl. Res. Cent., Mo. Dep. Conserv., Columbia 65201]

78-001870 Pigg, J. A SURVEY OF THE FISHES OF THE MUDDY BOGGY RIVER IN SOUTH CENTRAL OKLAHOMA. Proc. Okla. Acad. Sci. 57: 68-82. 1977. SFA 23(3)
[Moore High School., Moore, OK] A survey of the fishes of the Muddy Boggy River in south central Oklahoma produced 90 species representing 21 families. Eleven additional species have been reported by others, for a total of 101 species known to occur in Muddy Boggy River. Thirty-four species are new records for the Muddy Boggy River drainage. A description of the Muddy Boggy River System, a brief history of ichthyological collections within the drainage, an annotated checklist with remarks on distribution and probable abundance of each species are included.

78-001871 Rajagopalan, M.; Karuppaswamy, P.; Regunathan, A. /NEMIPTERUS DELAGOAE/ SMITH (NEMIPTERIDAE: PISCES) A NEW RECORD FROM THE INDIAN SEAS. Indian J. Fish. 22 (1,2): 274-276. 1975. SFA 23(3)
[Cent. Mar. Fish. Res. Inst., Cochin-18, India]

78-001872 Repetski, J. E. A FISH FROM THE UPPER CAMBRIAN OF NORTH AMERICA. Science 200 (4341): 529-531. 5 May 1978. SFA 23(3)
[U.S. Geol. Surv., U.S. Natl. Mus., Washington, DC 20560] Phosphatic dermal fragments of /Anatolepis/, interpreted as a heterostracan fish (class Agnatha), have been discovered in the Deadwood Formation of Late Cambrian age in northeastern Wyoming. This discovery estends back the age of the earliest known vertebrate fossils by approximately 40 million years. Other occurrences of /Anatolepis/ in North America, Greenland, and Spitzbergen show that these fish had a widespread geographic distribution in Late Cambrian and Early Ordovician marine environments.

78-001873 Robison, H. W. DISTRIBUTION, HABITAT NOTES, AND STATUS OF THE IRONCOLOR SHINER, /NOTROPIS CHALYBAEUS/ COPE, IN ARKANSAS. Proc. Ark. Acad. Sci. 31: 92-94. 1977. SFA 23(3)

[Dep. Biol. Sci., South. Ark. Univ., Magnolia 71753] Field work throughout Arkansas since 1971 and a search of museum records have yielded 35 collections of the ironcolor shiner, /Notropis chalybaeus/ Cope (Cyprinidae), not previously documented in Arkansas. From these data the ironcolor shiner is considered to be confined to the Coastal Plain physiographic province of Arkansas below the Fall Line, becoming most abundant in the Ouachita and Red River drainages of southern Arkansas. Notes on habitat preference, species associates, and current status of /N. chalybaeus/ within Arkansas are presented.

78-001874 Sauskan, V. I.; Ryzhov, V. M. INVESTIGATION OF COMMUNITIES OF DEMERSAL FISH OF CAMPECHE BANK. Oceanology 17 (2): 223-227. Oct. 1977. SFA 23(3)

The composition of fish communities and the association of trawl stations according to ichthyofauna are analyzed in the present paper employing for the first time a statistical method with utilization of a hypergeometric-distribution function, earlier employed only during study of planktonic biocenoses. As a result of analysis of materials collected in 1971-1973 during trawl surveys of Campeche Bank, the composition of recurrent groups of fish (communities) was demonstrated and the zones of their distribution in different seasons of the year determined. In the authors' opinion the hypergeometric-distribution function may be employed for study of the composition and distribution of communities of demersal fish on shelves if all data are gathered using a single standard method.

78-001875 Scoppettone, G. G.; Smith, J. J. ADDITIONAL RECORDS ON THE DISTRIBUTION AND STATUS OF NATIVE FISHES IN ALAMEDA AND COYOTE CREEKS, CALIFORNIA. Calif. Fish Game 64 (1): 61-65. Jan. 1978. SFA 23(3)

[U.S. FWS, Federal Bldg., Reno, NV 89502]

78-001876 Sloterdijk, H. H. EXTENSION D'AIRE DE LA REPARTITION GEOGRAPHIQUE DE L'ESTURGEON NOIR, /ACIPENSER OXYRHYNCHUS/ MITCHILL, DANS LE FLEUVE SAINT-LAURENT AU QUEBEC. [EXTENSION OF THE KNOWN DISTRIBUTION OF THE ATLANTIC STURGEON, /ACIPENSER OXYRHYNCHUS/ MITCHILL, FROM THE ST. LAWRENCE RIVER IN QUEBEC.] Nat. Can. (Que.) 105 (1): 53-54. Jan.-Feb. 1978. In French with English summ. SFA 23(3)

[Minist. Tour. Chasse Peche, 5075 rue Fullum, Montreal H2H 2K3, PQ, Canada] On August the 26th, 1978, an Atlantic Sturgeon, /Acipenser oxyrhynchus/ M., was caught in the St. Lawrence River near Vercheres (45°50'30" N - 73°18'30" W), representing an extension of its known distribution by 50 km above Lake St. Pierre, where one capture was reported in 1946, and by 100 km above Trois-Rivieres, its usual upstream limit.

78-001877 Smith, J. J. DISTRIBUTION, MOVEMENTS AND ECOLOGY OF THE FISHES OF THE PAJARO RIVER SYSTEM, CALIFORNIA. Ph.D. dissertation, Univ. Calif. (Davis) 233p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(10):4624. Apr. 1978. SFA 23(3)

The species of the Pajaro River system can be broken into eleven loose fish associations in five macrohabitat zones based upon their macro and microhabitat distributions. These associations and the ecology and distributions of the individual species are discussed. Number of species increased downstream, but there were three

78-001877 CONTINUED
replacements. Two of the replacements were probably due to temperature, and the third might have been due to competition. Two other species disappeared from several main river sites, apparently due to high turbidity.--From abstr.

78-001878 Stanley, J. G.; Miley, W. W. II; Sutton, D. I. REPRODUCTIVE REQUIREMENTS AND LIKELIHOOD FOR NATURALIZATION OF ESCAPED GRASS CARP IN THE UNITED STATES. Trans. Am. Fish. Soc. 107 (1): 119-128. Jan. 1978. SFA 23(3)
[Maine Coop. Fish. Res. Unit, Univ. Me., Orono 04473]

78-001879 Taylor, T. L. GAME/NON-GAME FISH RELATIONSHIPS IN THE STREAMS OF THE CLEAR LAKE BASIN. Cal-Neva Wildl. Trans. 1977: 49-59. 1977. Copies available from The Wildlife Society, 4606 San Marino Drive, Davis, CA 95616. SFA 23(3)
[Univ. Calif., Davis] Fish distribution patterns in the streams tributary to Clear Lake, Lake County, California were investigated by electroshocking 120 block netted 30.5 meter sections during the summer and fall of 1975. Eleven species of fish occurred in the seven separate drainages. Five of these species occurred in enough abundance to warrant statistical testing. Results of a correlation analysis are discussed and related to environmental and seasonal variables that when ignored give misleading information about the ecology of the species present. Species distribution patterns show that species addition occurs proceeding downstream. Three distinct zones are visible, the Trout Zone, Trout-roach Zone and Cyprinid-catostomid Zone.

78-001880 Venkataraman, G.; Badrudeen, M. A NEW DISTRIBUTIONAL RECORD OF /GERRES MACRACANTHUS/ BLEEKER FROM INDIAN WATERS. Indian J. Fish. 22 (1,2): 290-293. 1975. SFA 23(3)
[Mandapam Reg. Cent. C.M.F.R. Inst., Mandapam, India]

78-001881 Vodovskaya, V. V. ON THE CONNECTION BETWEEN THE ABUNDANCE OF THE CASPIAN SHAD, /CASPIALOSA KESSLERI/, AND ITS DISTRIBUTION IN THE NORTHERN CASPIAN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 163-166. 1977. SFA 23(3)
[KaspNIIRKh, Astrakhan, USSR]

78-001882 Wells, A. W. OCCURRENCE OF THE SLIMY SCULPIN, /COTTUS COGNATUS/, IN THE MISSOURI DRAINAGE SYSTEM. Can. Field-Nat. 91 (4): 415-416. Oct.-Dec. 1977. SFA 23(3)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

78-001883 Yaremenko, V. V.; Budayeva, V. D. ON THE PENETRATION OF WARM-WATER FISHES INTO THE WATERS OF SOUTH-WESTERN SAKHALIN IN 1975. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 323-324. 1977. SFA 23(3)
[SakhTINRO, Sakhalin, USSR]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

78-001884 Bailey, W. M. A COMPARISON OF FISH POPULATIONS BEFORE AND AFTER EXTENSIVE GRASS CARP STOCKING. Trans. Am. Fish. Soc. 107 (1): 181-206. Jan. 1978. SFA 23(3)
[Ark. Game Fish Comm., Little Rock 72201]

78-001885 Blinov, V. V. THE CONNECTION BETWEEN THE NATURAL MORTALITY AND REPRODUCTION OF FOOD FISHES AND MODELING OF THE PROCESSES INVOLVED. J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.) 16 (6): 1033-1036. 1976. SFA 23(3)
[VNIRO, Moscow, USSR]

78-001886 Chistobayeva, R. Ye. NATURAL REPRODUCTION OF THE PECHORA SALMON, /SALMO SALAR/, IN RELATION TO A SUSTAINED YIELD FISHERY. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 154-160. 1977. SFA 23(3)
[GosNIORKh, Leningrad, USSR]

78-001887 Eldridge, M. B.; King, D. J.; Eng, D.; Bowers, M. J. ROLE OF THE OIL GLOBULE IN SURVIVAL AND GROWTH OF STRIPED BASS (/MORONE SAXATILIS/) LARVAE. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 303-313. July 1977. SFA 23(3)
[NMFS, 3150 Paradise Dr., Tiburon, CA 94920]

78-001888 Forester, T. S.; Lawrence, J. M. EFFECTS OF GRASS CARP AND CARP ON POPULATIONS OF BLUEGILL AND LARGEMOUTH BASS IN PONDS. Trans. Am. Fish. Soc. 107 (1): 172-175. Jan. 1978. SFA 23(3)
[Ala. Water Improvement Comm., State Office Bldg., Montgomery 36130]

78-001889 Kilgen, R. H. GROWTH OF CHANNEL CATFISH AND STRIPED BASS IN SMALL PONDS STOCKED WITH GRASS CARP AND WATER HYACINTHS. Trans. Am. Fish. Soc. 107 (1): 176-180. Jan. 1978. SFA 23(3)
[Dep. Biol. Sci., Nicholls State Univ., Thibodaux, LA 70301]

78-001890 Llorca, M. N. PHYSICO-CHEMICAL OBSERVATIONS IN SOME PILOT AREAS DURING THE PEAK SEASON OF BANGUS FRY, /CHANOS CHANOS/ IN VISAYAN PROVINCES. Philipp. J. Fish. 14 (2): 236-257. July-Dec. 1976. SFA 23(3)
[Fish. Res. Div., Bur. Fish. Aquatic Resour., Intramuros, Manila, Philippines] The research on the biological assessment of bangus, shrimp and eel fry in Luzon, Visayas and Mindanao were ushered in by investigations of the physico-chemical conditions that exist in selected fry grounds during the peak fry seasons in 1974. The survey conducted in the Visayan islands showed that the distribution of the environmental conditions in a given fishing ground has a deep influence on periodic and seasonal migration and occurrence of fish. The physical and chemical factors influence the abundance of the food indirectly, and the abundance of these species in the fishing areas directly. The results of the survey give us an idea of fish behavior with respect to the environmental conditions.

78-001891 Yel'tsova, V. N. PREDATION ON BAIKAL OMUL (/COREGONUS AUTUMNALIS MIGRATORIUS/) LARVAE BY COMMON FISHES IN THE POSOL'SKIY LAGOON OF LAKE BAIKAL FOLLOWING THEIR RELEASE FROM THE BOL'SHAYA RECHKA HATCHERY. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 16 (6): 971-976. 1976. SFA 23(3)
[Biol. Res. Inst., Irkutsk Univ., USSR] When the feeding of fishes in the Posol'skiy lagoon was investigated during the downstream migration of omul larvae it was found that they had an appreciable influence on the abundance of the juvenile omul. The highest consumption of omul larvae was recorded in yearling and two year old fishes (perch, roach, ide). A single perch yearling consumes an average of 30 omul larvae a day, a roach yearling consumes 26 and an ide yearling 74. During the mass run of the omul larvae the majority are consumed by fishes in the strait joining the Lesser and Greater Posol'skiy lagoons. Approximately 42 million omul larvae are destroyed here, which is 1/3 of all the omul larvae migrating downstream in this period. If the survival of the juvenile omul in the Posol'skiy lagoon is to be increased it is essential to reduce the abundance of yearling and two year old common fishes at the time of the downstream migration by their intensive removal by all available means.--Concl.

78-001892 Yoshiyama, R. M. COMPETITION AND ROCKY INTERTIDAL FISHES. Ph.D. dissertation, Stanford Univ. 177p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(9):4049. Mar. 1978. SFA 23(3)

IDENTIFICATION, KEYS, CLASSIFICATION

78-001893 Allen, G. R.; Bauchot, M.-L.; Desoutter, M. THE STATUS OF /ABUDEFDUF SEXFASCIATUS/ (LACEPEDE), A POMACENTRID FISH FROM THE INDO-WEST PACIFIC. Copeia 1978 (2): 328-330. 5 May 1978. SFA 23(3)
[Dep. Fish., West. Aust. Mus., Francis St., Perth, Australia]

78-001894 Antony Raja, B. T.; Lazarus, S. A DESCRIPTION OF /SARDINELLA DAYI/ REGAN (PISCES: CLUPEIDAE) OF INDIAN SEAS WITH REMARKS ON ITS CLOSE SIMILARITY WITH /SARDINELLA MADERENSIS/ (LOWE) AND /SARDINELLA JUSSIEUI/ (VALENCIENNES). Indian J. Fish. 22 (1,2): 113-125. 1975. SFA 23(3)
[Dep. Agric., Krishi Bhavan, New Delhi-1, India]

78-001895 Baird, D. STUDIES ON CARBONIFEROUS FRESHWATER FISHES. Am. Mus. Novit. No. 2641. 22p. Jan. 1978. SFA 23(3)
[Am. Mus. Nat. Hist., Central Park West at 79th St., New York, NY 10024]

78-001896 Barel, C. D. N.; van Oijen, M. J. P.; Witte, F.; Witte-Maas, E. L. M. AN INTRODUCTION TO THE TAXONOMY AND MORPHOLOGY OF THE HAPLOCHROMINE CICHLIDAE FROM LAKE VICTORIA. Neth. J. Zool. 27 (4): 333-389. Dec. 1977. SFA 23(3)
[Zool. Lab., Kaiserstraat 63, Postbus 9516, Leiden 2300 RA, The Netherlands]

78-001897 Burr, B. M. SYSTEMATICS OF THE NORTH AMERICAN PERCID FISHES OF THE SUBGENUS /MICROPERCA/, GENUS /ETHEOSTOMA/. Ph.D. dissertation, Univ. Ill. (Urbana-Champaign) 211p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(10):4679. Apr. 1978. SFA 23(3)

78-001898 Caruso, J. H. THE SYSTEMATICS OF THE FISH FAMILY LOPHIIDAE. Ph.D. dissertation, Tulane Univ. 229p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(9):4106. Mar. 1978. SFA 23(3)

78-001899 Casteel, R. W. /DAMALICHTHYS SARATOGENSIS/: A NEW FRESHWATER FISH (EMBIOTOCIDAE) FROM THE PLIO-PLEISTOCENE (BLANCAN) OF CALIFORNIA. Copeia 1978 (2): 293-298. 5 May 1978. SFA 23(3)
[Dep. Archaeol., Simon Fraser Univ., Burnaby, BC VA 1S6, Canada]

78-001900 Chorn, J. FOSSIL LUNGFISHES IN KANSAS. Trans. Kans. Acad. Sci. 79: 95-96. 1976. Abstract only. SFA 23(3)
[Dep. Syst. Ecol., Univ. Kans., Lawrence]

78-001901 Coad, B. W.; Qadri, S. U. STATUS OF THE GENERIC NAME /ENDEMICHTHYS/ (OSTEICHTHYES). Copeia 1978 (2): 330. 5 May 1978. SFA 23(3)
[Dep. Biol., Pahlovi Univ., Shiraz, Iran]

78-001902 Colin, P. L. /SERRANUS INCISUS/, NEW SPECIES FROM THE CARIBBEAN SEA (PISCES: SERRANIDAE). Proc. Biol. Soc. Wash. 91 (1): 191-196. 3 May 1978. SFA 23(3)
[Dep. Mar. Sci., Univ. Puerto Rico, Mayaguez 00708]

78-001903 Collette, B. B.; Russo, J. L.; Zavala-Camin, L. A. /SCOMBEROMORUS BRASILIENSIS/, A NEW SPECIES OF SPANISH MACKEREL FROM THE WESTERN ATLANTIC. NOAA Fish. Bull. 76 (1): 273-280. Jan. 1978. In English with Portugese summ. SFA 23(3)
[NMFS, Syst. Lab., Natl. Mus. Nat. Hist., Washington, DC 20560]

78-001904 Cooper, J. E. IDENTIFICATION OF EGGS, LARVAE, AND JUVENILES OF THE RAINBOW SMELT, /OSMERUS MORDAX/, WITH COMPARISONS TO LARVAL ALEWIFE, /ALOSA PSEUDOHARENGUS/, AND GIZZARD SHAD, /DOROSOMA CEPEDIANUM/. Trans. Am. Fish. Soc. 107 (1): 56-62. Jan. 1978. SFA 23(3)
[Appalachian Environ. Lab., Univ. Md., Frostburg 21532]

78-001905 Dawson, C. E. /SYNGNATHUS PARVICARINATUS/, A NEW AUSTRALIAN PIPEFISH, WITH NOTES ON /S. SAUVAGEI/ (WHITLEY) AND /LEPTONOTUS CARETTA/ (KLUNZINGER). Copeia 1978 (2): 288-293. 5 May 1978. SFA 23(3)
[Gulf Coast Res. Lab. Mus., Ocean Springs, MS 39564]

78-001906 Dawson, C. E. REVIEW OF THE INDO-PACIFIC PIPEFISH GENUS /HIPPICHTHYS/ (SYNGNATHIDAE). Proc. Biol. Soc. Wash. 91 (1): 132-157. 3 May 1978. SFA 23(3)
[Gulf Coast Res. Lab. Mus., Ocean Springs, MS 39564]

78-001907 Devaraj, M. OSTEOLOGY AND RELATIONSHIPS OF THE SPANISH MACKERELS AND SEERFISHES OF THE TRIBE SCOMBEROMORINI. Indian J. Fish. 22 (1, 2): 1-67. 1975. SFA 23(3)
[Reg. Cent. Cent. Mar. Fish. Res. Inst., Mandapam Camp, India]

78-001908 Fulton, W. A DESCRIPTION OF A NEW SPECIES OF /GALAXIAS/ (PISCES: GALAXIIDAE) FROM TASMANIA. Aust. J. Mar. Freshwater Res. 29 (1): 109-116. Feb. 1978. SFA 23(3)
[Inland Fish. Comm., 127 Davey St., Hobart, Tasmania 7000, Australia]

78-001909 Gold, J. R.; Gall, G. A. E.; Nicola, S. J. TAXONOMY OF THE COLORADO CUTTHROAT TROUT (/SALMO CLARKI PLEURITICUS/) OF THE WILLIAMSON LAKES, CALIFORNIA. Calif. Fish Game 64 (2): 98-103. Apr. 1978. SFA 23(3)
[Genet. Sect., Texas A&M Univ., College Station 77843] We have examined 13 meristic characteristics, 19 morphometric measurements, coloration and spotting, and dentition from 21 specimens of cutthroat trout from the Williamson Lakes of the southern Sierra Nevada, California. According to records of the California Department of Fish and Game, these trout are descendant from fertilized eggs of the Colorado cutthroat trout, /Salmo clarki pleuriticus/, which were taken in 1931 from Trapper's Lake, Colorado. A comparison of selected meristic characteristics revealed no differences between the Williamson Lakes cutthroat trout and /S. c. pleuriticus/ from Colorado, Wyoming, and Utah. Life colors, spotting, and the presence of basibranchial detention also identify the Williamson Lakes cutthroat trout as /S. c. pleuritucus/. The similarities between the Williamson Lakes /pleuriticus/ and those from present day Trapper's Lake suggest that the stocking of Trapper's Lake (subsequent to the California transplant) with Yellowstone cutthroat trout, /S. c. lewisi/, has had no detectable effect on the native Trapper's Lake /pleuriticus/ population.

78-001910 Greenfield, D. W.; Glodek, G. G. /TRACHELYICHTHYS EXILIS/, A NEW SPECIES OF CATFISH (PICES: AUCHENIPTERIDAE) FROM PERU. Fieldiana Zool. 72 (3): 47-58. 19 Dec. 1977. SFA 23(3)
[Div. Fish., Field Mus. Nat. Hist., Chicago, IL]

78-001911 Iwamoto, T. EASTERN PACIFIC MACROURIDS OF THE GENUS /COELORINCHUS/ GIORNA (PISCES: GADIFORMES), WITH DESCRIPTION OF A NEW SPECIES FROM CHILE. Proc. Calif. Acad. Sci. 41 (12): 307-337. 8 Feb. 1978. SFA 23(3)
[Calif. Acad. Sci., Golden Gate Park, San Francisco 94118]

78-001912 Kendall, A. W., Jr. RELATIONSHIPS AMONG AMERICAN SERRANID FISHES BASED ON THE MORPHOLOGY OF THEIR LARVAE. Ph.D. dissertation, Univ. Calif. (San Diego) 224p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(9):4002. Mar. 1978. SFA 23(3)

78-001913 Kovalevskaya, N. V. LARVAE AND FRY OF FLYING FISHES FROM THE FAMILY EXOCOETIDAE, /CHEILOPOGON CYANOPTERUS/, /C. SPILONOTOPTERUS/ AND /C. LONGIBARBUS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 259-267. 1977. SFA 23(3)
[IOAN, Moscow, USSR] From the materials collected in the tropical waters of the pacific, Indian and Atlantic Oceans, a description of the larvae and fry of three species of the genus /Cheilopogon/ is given: /C. cyanopterus/, /C. spilonotopterus/ and /C. longibarbus/. The larvae and fingerlings of these species are distinguished by the structure of the barbels, the size of the dorsal and anal fins and also by the nature of pigmentation and the characteristics of distribution.

78-001914 Markle, D. F. TAXONOMY AND DISTRIBUTION OF /ROULEINA ATTRITA/ AND /ROULEINA MADERENSIS/ (PISCES: ALEPOCEPHALIDAE). NOAA Fish. Bull. 76 (1): 79-87. Jan. 1978. SFA 23(3)
[Huntsman Mar. Lab., St. Andrews, NB E0G 2X0, Canada] Three Atlantic species of /Xenodermichthys/ and /Rouleina/ are recognized: /X. copei/, /R. attrita/, and /R. maderensis/. /Bathytroctes mollis/ and /B. aequatoris/ are considered junior synonyms of /R. attrita/. /Anomalopterus megalops/ is considered incerta sedis. Diagnostic characters for /R. attrita/ are: no photophores, convoluted testes, 43-48 lateral line scales, 43-46 preural vertebrae, papillae on body near lateral line, and maturation at a size around 250-300 mm standard length. Diagnostic characters for /R. maderensis/ are: photophores present, lobate testes, 50-56 lateral line scales, 47-50 preural vertebrae, papillae usually peripheral to photophores on fins and fin bases, and matruation at a size around 200-250 mm standard length. The two species are sharply segregated by depth: 91 percent of all /R. maderensis/ were from bottom trawls made between 595 and 1,200 m while 88 percent of all /R. attrita/ were from bottom trawls fished between 1,400 and 2,100 m.

78-001915 McDowall, R. M.; Fulton, W. A REVISION OF THE GENUS /PARAGALAXIAS/ SCOTT (SALMONIFORMES: GALAXIIDAE). Aust. J. Mar. Freshwater Res. 29 (1): 93-108. Feb. 1978. SFA 23(3)
[Fish. Res. Div., Minist. Agric. Fish., Wellington, New Zealand]

78-001916 McKinney, J. F.; Lachner, E. A. TWO NEW SPECIES OF /CALLOGOBIUS/ FROM INDO-PACIFIC WATERS (TELEOSTEI: GOBIIDAE). Proc. Biol. Soc. Wash. 91 (1): 203-215. 3 May 1978. SFA 23(3)
[Dep. Biol., Old Dominian Univ., Norfolk, VA 23508]

78-001917 Miller, P. J. THE SYSTEMATIC POSITON AND ORIGIN OF /GOBIUS OCHETICUS/ NORMAN, 1927, FROM THE SUEZ CANAL. Zool. J. Linn. Soc. 62 (1): 39-58. Jan. 1978. SFA 23(3)
[Zool. Dep., Univ. Bristol, Bristol BS8 1UG, England]

78-001918 Musiy, Yu. I.; Sergiyenko, V. A. FINGERLINGS OF THE GENUS /LUTJANUS/ (LUTJANIDAE, PERCIFORMES) FROM THE GULF OF ADEN. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 151-154. 1977. SFA 23(3)
[South. Fish. Prospecting Organ, Kerch, USSR]

78-001919 Myagkov, N. A.; Kondyurin, V. V. [TAXONOMIC STATUS OF SPINY DOGFISHES OF THE GENUS /SQUALUS/ IN THE EAST ATLANTIC.] Zool. Zh. 62 (1): 143-145. Jan. 1978. In Russian with English summ. SFA 23(3)
[Kaliningrad Tech. Inst. Fish. Ind., Kaliningrad, USSR] 116 sexually mature individuals of 3 species of the genus /Squalus/ (/S. acanthias/, /S. fernandinus/, /S. blainvillei/) were investigated in the East Atlantic. The former species belongs to the group /Acanthias/, the two latter to the group /Blainvillei-fernandinus/. A suggestion is put forward to the effect that the group /Blainvillei-fernandinus/ is transitional between the groups /Acanthias/ and /Megalops-cubensis/.

78-001920 Nelson, J. S. FISHES OF THE SOUTHERN HEMISPHERE GENUS /NEOPHRYNICHTHYS/ (SCORPAENIFORMES: COTTOIDEI), WITH DESCRIPTIONS OF TWO NEW SPECIES FROM NEW ZEALAND AND MACQUARIE ISLAND. J. R. Soc. N.Z. 7 (4): 485-511. 1977. SFA 23(3)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

78-001921 Seigel, J. A. REVIEW OF THE DWARF DALATIID SHARK GENUS /SQUALIOLIS/ SMITH AND RADCLIFFE: ANATOMY, SYSTEMATICS, AND ECOLOGY. M.A. thesis, Calif. State Univ. (Long Beach) 75p. 1977. From Masters Abstracts 16(1), Mar. 1978. SFA 23(3)
Examination of all available material of the dwarf dalatiid shark genus /Squaliolus/ Smith and Radcliffe indicates that the two nominal species, /S. sarmenti/ and /S. alii/, are junior synonyms of /Squaliolus laticaudus/. A detailed examination of the teeth, vertebral column, claspers, and viscera is presented and compared with two related genera, /Euprotomicrus/ and /Isistius/. The horizontal and vertical distribution of /Squaliolus/ is discussed and data presented indicated that it is a diurnal vertical migrator. Stomach contents are analyzed, and bioluminescence is reported for the first time and compared with other known luminescent sharks.

78-001922 Sidell, B. D.; Otto, R. G.; Powers, D. A. A BIOCHEMICAL METHOD FOR DISTINCTION OF STRIPED BASS AND WHITE PERCH LARVAE. Copeia 1978 (2): 340-343. 5 May 1978. SFA 23(3)
[Dep. Zool., Univ. Me., Orono 04473]

78-001923 Stein, D. L. A REVIEW OF THE DEEPWATER LIPARIDAE (PISCES) FROM THE COAST OF OREGON AND ADJACENT WATERS. Occas. Pap. Calif. Acad. Sci. No. 127. 55p. 8 Feb. 1978. SFA 23(3)
[Sch. Oceanogr., Oreg. State Univ., Corvallis 97331]

78-001924 Thompson, B. A. AN ANALYSIS OF THREE SUBGENERA (/HYPOHOMUS/, /ODONTOPHOLIS/ AND /SWAINIA/) OF THE GENUS /PERCINA/ (TRIBE ETHEOSTOMATINI, FAMILY PERCIDAE). Ph.D. dissertation, Tulane Univ. 409p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(9):4114. Mar. 1978. SFA 23(3)

78-001925 Uwate, K. R. A REVISION OF THE DEEPSEA ANGLERFISH FAMILY DICERATIIDAE (SUBORDER /CERATIOIDEI/) WITH DESCRIPTIONS OF TWO NEW SPECIES. M.A. thesis, Calif. State Univ. (Long Beach) 10p. 1977. From Masters Abstracts 16(1), Mar. 1978. SFA 23(3)

78-001926 Vari, R. P. THE GENUS /LEPTAGONIATES/ (PISCES: CHARACOIDEI) WITH A DESCRIPTION OF NEW SPECIES FROM BOLIVIA. Proc. Biol. Soc. Wash. 91 (1): 184-190. 3 May 1978. SFA 23(3)
[Dep. Ichthyol., Am. Mus. Nat. Hist., New York, NY 10024]

78-001927 Weitzman, S. H.; Kanazawa, R. H. THE SOUTH AMERICAN FISH GENUS /ELACHOCHARAX/ MYERS WITH A DESCRIPTION OF NEW SPECIES (TELEOSTEI: CHARACIDAE). Proc. Biol. Soc. Wash. 91 (1): 158-183. 3 May 1978. SFA 23(3)
[Dep. Vert. Zool., Natl. Mus. Nat. Hist., Washington, DC 20560]

78-001928 Wilson, M. V. H. MIDDLE EOCENE FRESHWATER FISHES FROM BRITISH COLUMBIA. R. Ont. Mus. Life Sci. Contrib. 113. 61p. 1 Dec. 1977. SFA 23(3)
[Dep. Zool., Univ. Alberta, Edmonton, AB, Canada]

78-001929 Zidek, J. HAMILTON QUARRY /ACANTHODES/ (ACANTHODII, PISCES). Trans. Kans. Acad. Sci. 79: 100-101. 1976. Abstract only. SFA 23(3)
[Sch. Geol. Geophys., Univ. Okla., Norman]

PARASITES AND DISEASES-GENERAL

78-001930 Amend, D. F. THE ROLE OF THE FISH HEALTH SECTION IN THE AFS. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 334. July 1977. SFA 23(3)
[Tavolek, Inc., Redmond, WA 98052]

78-001931 Becker, D. A.; Carr, W. D.; Heard, R. G.; Cloutman, D. G.; Holmes, P. D.; Evans, W. A.; Norman, M. D.; Owen, W. B., Jr. PRE- AND POST IMPOUNDMENT ICHTHYOPARASITE SUCCESSION IN A NEW ARKANSAS RESERVOIR. Univ. Ark. Water Resour. Res. Cent. Publ. No. 54. vi + 85p. 1978. SFA 23(3)
[Dep. Zool., Univ. Ark., Fayetteville 72701] Helminth and crustacean parasites from 2,387 /Micropterus dolomieui/, /M. punctulatus/, and /M. salmoides/ were utilized to monitor annual pre- and postimpoundment succession patterns spanning eight continuous years in Beaver Reservoir, Arkansas. Incidence of infection by ichthyoparasites with direct life cycles (monogenetic trematodes, leeches, and crustaceans) generally increased following impoundment, although leeches remained relatively constant. Exceptions to this general pattern occurred. Incidence of ichthyoparasites with indirect life cycles (digenetic trematodes, cestodes, acanthocephalans, and

78-001931 CONTINUED
nematodes) decreased immediately following impoundment with subsequent increases to a point equal or above that of preimpoundment, although exceptions occurred. Time for species adaptation to the reservoir environment varied, with some species disappearing and others occurring for the first time. Diversity indices indicated that a moderate parasite community was maintained in the White River two years prior to its impoundment to form Beaver Reservoir. During the first impoundment year the parasite community declined to the lowest postimpoundment level with the abrupt change in habitat. Throughout the following four postimpoundment years the parasite community gradually increased to become much larger and more complex than it was during preimpoundment. Parasite community succession stabilization occurred in the fifth postimpoundment year and continued the following year indicating the establishment of a climax ichthyoparasite community.

78-001932 Deutsch, W. G. FISH PARASITES FROM THE SUSQUEHANNA RIVER IN PENNSYLVANIA, WITH NEW HOST RECORDS. Proc. Pa. Acad. Sci. 51 (2): 122-124. 1977. SFA 23(3)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603] From June through November 1973, 274 fish from the Susquehanna River were examined for parasites. About 85 percent were infected with one or more of 40 species of parasites. Most parasites were species specific and were most abundant in the spring and fall. No gross differences were found in the incidence of parasites at unpolluted and polluted (acid mine drainage) river sites. Infections were sometimes limited to, and were often greater in larger fish. New host records included digentic trematodes /Rhipidocotyle septpapillata/ in /Catostomus commersoni/ and /Pomoxis nigromaculatus/, /Lissorchis gullaris/ in /Carpiodes cyprinus/, and /Ptychogonimus fontanus/ in /Stizostedion vitreum/; a nematode /Hedruris/ sp. in /Micropterus dolomieui/; a copepod /Lernaea cyprinacea/ on /Esox niger/; a branchiuran /Argulus/ sp. on /C. cyprinus/; and a leech /Actinobdella inequiannulata/ on /C. cyprinus/.

78-001933 Fender, D. C.; Amend, D. F. HYPEROSMOTIC INFILTRATION: FACTORS INFLUENCING UPTAKE OF BOVINE SERUM ALBUMIN BY RAINBOW TROUT (/SALMO GAIRDNERI/). J. Fish. Res. Board Can. 35 (6): 871-874. June 1978. In English with French summ. SFA 23(3)
[U.S. FWS, Fish. Assistance Off., Olympia, WA]

78-001934 Ghittino, P.; Andruetto, S.; Vigliani, E. RECENT FINDINGS IN TROUT KIDNEY PATHOLOGY IN ITALY. Bull. Off. Int. Epiz. 87 (5-6): 491-493. 1977. SFA 23(3)
[Ist. Zooprof. Sper., Via Bologna, 148, 10154 Torino, Italy]

78-001935 Gordon, D.; Croll, N. A.; Rau, M. E. LES PARASITES DES ANIMAUX SAUVAGES DU QUEBEC. 1. LES PARASITES DES POISSONS ET DES MAMMIFERES DE LA REGION DE SCHEFFERVILLE. [THE PARASITES OF WILD ANIMALS OF QUEBEC. 1. THE PARASITES OF FISH AND MAMMALS OF THE SCHEFFERVILLE REGION.] Nat. Can. (Que.) 105 (1): 55. Jan.-Feb. 1978. In French. SFA 23(3)
[Inst. Parasitol., MacDonald Coll., McGill Univ., Sainte-Anne-de-Bellevue H0A 1C0, PQ, Canada]

78-001936 Howard, C. N. A SURVEY OF METAZOAN PARASITES FROM GEORGIA FISHES. Ga. J. Sci. 36 (2): 60. Apr. 1978. Abstract only. SFA 23(3)
[Georgia Coll., Milledgeville]

78-001937 McCain, B. B.; Myers, M. S.; Gronlund, W. D.; Wellings, S. R.; Alpers, C. E. THE FREQUENCY, DISTRIBUTION, AND PATHOLOGY OF THREE DISEASES OF DEMERSAL FISHES IN THF BERING SEA. J. Fish Biol. 12 (4): 267-276. Apr. 1978. SFA 23(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] During September and October, 1975, bottom-dwelling fish from the Bering Sea were examined for diseases. The three most commonly observed diseases and their frequency of occurrence were epidermal papillomas of rock sole, 1.0 percent; lymphocystis of yellowfin sole, 2.1 percent; and epidermal tumours of the pseudobranch of adult Pacific cod, 7.4 percent. Both the appearance and the histological characteristics of epidermal papillomas on rock sole resembled those found on several species of flatfish in Puget Sound. The frequency of tumour-bearing rock sole ranged from 0-23 percent, with the highest occurrence at sampling stations around the periphery of the Bering Sea in water depths of 20-30 fathoms (36-54 m). The virus-caused lymphocystis lesions were usually on the 'blind' side fins and skin surfaces of yellowfin sole, the largest lesions being found on the operculum, and the most common site of infection was the pectoral fin. The frequency of lymphocystis was 0-15 percent, with a gradual increase of prevalence from the northern to southern sampling stations. The Pacific cod tumours were always bilateral, and contained remnants of normal-appearing pseudobranchial tissue on the surface or deep inside the tumours. Portions of some tumcurs were nectrotic and liquified. Tumour-bearing cod were most commonly found in the south and south-eastern Bering Sea and the frequency of affected cod ranged from 0-100 percent.

78-001938 Moller, H. THE EFFECTS OF SALINITY AND TEMPERATURE ON THE DEVELOPMENT AND SURVIVAL OF FISH PARASITES. J. Fish Biol. 12 (4): 311-323. Apr. 1978. SFA 23(3)
[Inst. Meereskd., Univ. Kiel, 23 Kiel, Dusternbrooker Weg 20, West Germany]

78-001939 Olson, R. E. PARASITES OF SILVER (COHO) SALMON AND KING (CHINOOK) SALMON FROM THE PACIFIC OCEAN OFF OREGON. Calif. Fish Game 64 (2): 117-120. Apr. 1978. SFA 23(3)
[Dep. Zool., Oreg. State Univ., Mar. Sci. Cent., Newport 97365] During the summer of 1972, 80 silver salmon (/Oncorhynchus kisutch/) and 15 king salmon (/O. tshawytscha/) caught in the Pacific Ocean off Newport, Oregon, were examined for parasites. A total of 16 parasite species (11 of marine origin) were found in silver salmon and seven species (six of marine origin) in king salmon. Larval /Anisakis/ sp were found commonly in both host species. These nematodes are of potential public health importance since larval anisakids have been implicated elsewhere as human pathogens. Data on the prevalence of /Nanophyetus salmincola/ and /Salvelinema walkeri/ in silver salmon indicates that these species have potention value as biological tags.

BACTERIAL DISEASES

78-001940 Egidius, E. C.; Andersen, K. HOST-SPECIFIC PATHOGENICITY OF STRAINS OF /VIBRIO ANGUILLARUM/ ISOLATED FROM RAINBOW TROUT /SALMO GAIRDNERI/ RICHARDSON AND SAITHE /POLLACHIUS VIRENS/ (L.). J. Fish Dis. 1 (1): 45-50. Jan. 1978. SFA 23(3)
[Inst. Mar. Res., P.O. Box 1870, 5011 Bergen, Norway] /Vibrio anguillarum/ strains isolated from diseased rainbow trout were found to be pathogenic to salmonids and probably to a very low extent to saithe. Strains isolated from saithe were pathogenic to saithe and non-pathogenic to salmonids.

78-001941 Elsarnagawy, D. ISOLATION OF SOME /VIBRIO PARAHAEMOLYTICUS/ STRAINS FROM SALTED EGYPTIAN FISH. Riv. It. Piscic. Ittiop. 13 (1): 21-25. Jan.-Feb.-Mar. 1978. In English and Italian. SFA 23(3)
[Staatl. Vet., Dresdenstr. 6, 3300 Braunschweig, West Germany]

78-001942 Fryer, J. L.; Amend, D. F.; Harrell, L. W.; Novotny, A. J; Plumb, J. A.; Rohovec, J. S.; Tebbit, G. L. DEVELOPMENT OF BACTERINS AND VACCINES FOR CONTROL OF INFECTIOUS DISEASES IN FISH. Oreg. State Univ. Sea Grant Prog. Publ. No. ORESU-T-77-012. 10p. Dec. 1977. Available at $2.50 from Sea Grant Communications, Oregon State University, Corvallis 97331. SFA 23(3)
[Dep. Microbiol., Oreg. State Univ., Corvallis 97331]

78-001943 Ghittino, P.; Andruetto, S. FISH VIBRIOSIS IN FRESH AND SALT WATERS IN ITALY. Bull. Off. Int. Epiz. 87 (5-6): 483-485. 1977. SFA 23(3)
[Ist. Zooprof. Sper., Via Bologna, 148, 10154 torino, Italy]

78-001944 Kusuda, R.; Kawai, K.; Jo, Y.; Akizuki, T.; Fukunaga, M.; Kotake, N. [EFFICACY OF ORAL VACCINATION FOR VIBRIOSIS IN CULTURED AYU.] Bull. Jpn. Soc. Sci. Fish. 44 (1): 21-25. Jan. 1978. In Japanese with English summ. SFA 23(3)
[Dep. Cult. Fish., Fac. Agric., Kochi Univ., Nankoku, Kochi Pref., Japan] Efficacy of four kinds of oral vaccine for control of vibriosis in cultured ayu (/Plecoglossus altivelis/) was investigated. Nutrient broth inoculated with /Vibrio anguillarum/, the etiological agent of vibriosis in ayu, Was incubated with shaking. Cells were harvested and inactivated with formalin. The bacterine thus prepared was ultrasonicated, heated or mixed with Freund incomplete adjuvant. These four kinds of vaccine were administered at a level of 0.4 g wet weight of cells per kg body-weight per day. The efficacy of vaccination was tested by exposing fish to the bacteria discharged from artificially infected ayu. The formalin-killed bacterine and formalin-killed and ultrasonicated bacterine were highly effective, but production of antibody in the blood was not observed. The heated bacterine also was effective when administered at a level of 4.0 g. Administration of formalin-killed bacterine at a level of 4.0 g for more than 2 weeks resulted in low mortality of about 10 percent in contrast to about 90 percent for the controls. This efficacy of vaccination was maintained for four weeks, and when booster was administered it was prolonged further. Though many antigens were contained in the bacterine, heat resistant antigens were considered to play an important role in protection against vibrio infection.

78-001945 Kusuda, R.; Komatsu, i.; Kawai, K. /STREPTOCOCCUS/ SP. ISOLATED FROM AN EPIZOOTIC OF CULTURED EELS. Bull. Jpn. Soc. Sci. Fish. 44 (3): 295. Mar. 1978. SFA 23(3)
[Dep. Cult. Fish., Fac. Agric., Kochi Univ., Nankoku, Kochi Pref., Japan]

78-001946 Kusuda, R.; Kimura, H. STUDIES ON THE PATHOGENESIS OF STREPTOCOCCAL INFECTION IN CULTURED YELLOWTAILS /SERIOLA/ SPP.: THE FATE OF /STREPTOCOCCUS/ SP. BACTERIA AFTER INOCULATION. J. Fish Dis. 1 (1): 109-114. Jan. 1978. SFA 23(3)
[Fish Dis. Lab., Dep. Cult. Fish., Fac. Agric., Kochi Univ., Nongoku, Kochi Pref., Japan] The causative agent of streptococcal infection of yellowtails has been isolated but no information is presently available with repsect to the mechanism of infection. The present study deals with the growth of the bacteria in the fish body at various periods after either per-oral or per-cutaneous challenge with /Streptococcus/ sp. YT-3 strain at different passage levels. After percutaneous challenge with bacteria of high virulence, the kidneys retained the bacteria with the relatively high count of 10^7 cells per gram of tissue while in other organs, although high concentrations of 10^5-10^6 cells were detected in 10 min, this was followed by a progressive decrease up to 24 post-inoculation with a subsequent rapid increase during the later stages of the disease process. The highest rate of growth was obtained in the intestine, where 10^7 cells were detected at 72 h after inoculation. After oral challenge, the bacteria were detected at high levels from organs and blood within 10 min but they were completely removed from all organs except the intestine within 24 h.

78-001947 Lannan, J. E. VIBRIOSIS VACCINATION OF CHUM SALMON BY HYPEROSMOTIC INFILTRATION. Prog. Fish-Cult. 40 (2): 43-45. Apr. 1978. SFA 23(3)
[Dep. Fish. Wildl., Oreg. State Univ., Mar. Sci. Cent., Newport 97365]

78-001948 Lund, J. E.; Abernethy, C. S. IESIONS OF TUBERCULOSIS IN MOUNTAIN WHITEFISH (/PROSOPIUM WILLIAMSONI/). J. Wildl. Dis. 14 (2): 222-228. Apr. 1978. SFA 23(3)
[Agric. Res. Dev., Upjohn Co., Kalamazoo, MI 19001] Lesions of tuberculosis in mountain whitefish (/Prosopium williamsoni/) were present in all visceral organs. The tubercles were composed of large rounded macrophages which contained numerous intracytoplasmic acid-fast bacilli. The lesions were not encapsulated and mineralization was not observed.

78-001949 O'Leary, P. J.; Cisar, J. O.; Fryer, J. L. THE EFFECT OF TEMPERATURE ON AGGLUTINATION ACTIVITY OF COHO SALMON /ONCORHYNCHUS KISUTCH/ (WALBAUM) ANTISERUM. J. Fish Dis. 1 (1): 123-125. Jan. 1978. SFA 23(3)
[Dr. J. L. Fryer: Dep. Microbiol., Oreg. State Univ., Corvallis 97331] The effects of temperature on the activity of antisera from coho salmon (/Oncorhynchus kisutch/) and from rabbit were compared. Agglutination activity of salmon anti-/Aeromonas salmonicida/ serum declined following incubation at 55°C whereas rabbit antiserum lost agglutination activity after incubation at 65°C.

78-001950 Strout, R. G.; Sawyer, E. S.; Coutermarsh, B. A. PATHOGENIC VIBRIOS IN CONFINEMENT-REARED AND FERAL FISHES OF THE MAINE-NEW HAMPSHIRE COAST. J. Fish. Res. Board Can. 35 (4): 403-408. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Anim. Sci., Kendall Hall, Univ. N. Hamp., Durham 03824]

78-001951 Wyatt, L. E. MICROBIOLOGICAL PROFILES OF FRESH WATER CATFISH. Ph.D. dissertation, Texas A&M Univ. 96p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(11):5206 May 1978. SFA 23(3)

78-001952 Zarick, P. P. THE BACTERIUM /AEROMONAS HYDROPHILA/ VAR. /LIQUEFACIENS/ (CHESTER) STANIER IN THE CHANNEL CATFISH (/ICTALURUS PUNCTATUS/). Ph.D. dissertation, Georgetown Univ. 235p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(9):4022. Mar. 1978. SFA 23(3)

FUNGAL DISEASES

78-001953 Olah, J.; Farkas, J. EFFECT OF TEMPERATURE, PH, ANTIBIOTICS, FORMALIN AND MALACHITE GREEN ON THE GROWTH AND SURVIAL OF /SAPROLEGNIA/ AND /ACHLYA/ PARASITIC ON FISH. Aquaculture 13 (3): 273-2889 Mar. 1978. SFA 23(3)
[Fish. Res. Inst., H-5541 Szarvas, Hungary] Twenty-four strains of /Saprolegnia/ and /Achlya/ were isolated from different fish-rearing ecosystems and from diseased carp. Special test methods were developed to measure growth of the strains at different pH and temperature levels. Sensitivity and survival were determined for antibiotics and for 40 concentrations of formalin, malachite green and formalin-malachite green mixture. Out of the 33 antibiotics tested only nalidixic acid exerted a significant growth inhibiting effect. The minimum bathing treatment times necessary for 100 percent mortality (LT 100) at the different concentrations were determined, and then efficiency curves were constructed by means of computerized analysis of the data. A wide choice of concentrations and treatment times is suggested for practical use.

78-001954 Richards, R. H.; Pickering, A. D. FREQUENCY AND DISTRIBUTION PATTERNS OF /SAPROLEGNIA/ INFECTION IN WILD AND HATCHERY-REARED BROWN TROUT /SALMO TRUTTA/ L. AND CHAR /SALVELINUS ALPINUS/ (L.). J. Fish Dis. 1 (1): 69-82. Jan. 1978. SFA 23(3)
[Unit Aquatic Pathol., Univ. Stirling, Stirling FK9 4LA, Scotland] Fungal infection of sexually mature brown trout and char was associated with a particular type of /Saprolegnia/ exhibiting a low degree of homothallic sexuality. Hatchery-reared brown trout were more severely infected (in terms of the percent area of the body covered with the fungus) than were wild fish. The fins of hatchery-reared fish were particularly prone to /Saprolegnia/ infection regardless of sex. In wild brown trout, a sexual difference in the pattern of infection was demonstrated. The flanks of the male fish appeared to be more prone to infection when compared with the female and there was a greater susceptibility of the caudal and ventral fin of the female when compared with the male. Evidence is presented which suggests that the incidence of infection in mature male salmonid fish prior to spawning is significantly greater than in the females. This difference may not be apparent in spent fish after spawning. These findings are discussed in relation to the background concentration of fungal spores in the water, the behavioural characteristics of spawning fish and differences in epidermal structure.

78-001955 Willoughby, L. G. SAPROLEGNIAS OF SALMONID FISH IN WINDERMERE: A CRITICAL ANALYSIS. J. Fish Dis. 1 (1): 51-67. Jan. 1978. SFA 23(3)

[Freshwater Biol. Assoc., Ambleside, Cumbria, England] Fungal cultures attributed to the /Saprolegnia parasitica-diclina/ complex isolated from diseased salmonids, diseased coarse fish and natural water samples, are compared critically. The two species concept is not sustained and only /S. diclina/ Humphrey is conserved. This results in a more flexible framework for comparing isolates within this species and three groups are distinguished here, based on growth characteristics and length/breadth (L/B) ratio of the oogonium. Oospore size is also considered in this connection. In Windermere (English Lake District) only /Saprolegnia diclina/ Type 1 (L/B ratio ≥2≥13 percent) occurs as a parasite on salmonid fish. Only /S. diclina/ Type 2 (L/B ratio ≥2≤12 percent) occurs as a parasite on perch /Perca fluviatilis/ L. /Saprolegnia diclina/ Type 3 (L/B ratio ≥2≤10 percent) is purely saprophytic. An attempt is made to fit /S. parasitica-diclina/ isolates from natural water samples into this scheme so that the potential infectivity for a particular kind of fish could be assessed.

PROTOZOAN DISEASES

78-001956 Current, W. L. THE BIOLOGY OF /HENNEGUYA EXILIS/. Ph.D. dissertation, Univ. Nebr. (Lincoln) 84p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(7):3080. Jan. 1978. SFA 23(3)

78-001957 Current, W. L.; Janovy, J., Jr. COMPARATIVE STUDY OF ULTRASTRUCTURE OF INTERLAMELLAR AND INTRALAMELLAR TYPES OF /HENNEGUYA EXILIS/ KUDO FROM CHANNEL CATFISH. J. Protozool. 25 (1): 56-65. Feb. 1978. SFA 23(3)

[Dep. Zool.-Entomol., Auburn Univ., Auburn, AL 36830]

78-001958 Davies, A. J. COCCIDIAN PARASITES OF INTERTIDAL FISHES FROM WALES: SYSTEMATICS, DEVELOPMENT, AND CYTOCHEMISTRY. J. Protozool. 25 (1): 15-21. Feb. 1978. SFA 23(3)

[Cytopathol. Unit, St. Helier Hosp., Carshalton, Surrey, SM5 1AA, England]

78-001959 Desser, S. S.; Paterson, W. B. MORPHOLOGY OF THE SPORES OF /MYXOSOMA NOTROPIS/ FANTHAM, PORTER AND RICHARDSON, 1939. Can. J. Zool. 56 (2): 311-314. Feb. 1978. In English with French summ. SFA 23(3)

Dep. Microbiol. Parasitol., Fac. Med., Univ. Toronto, Toronto, ON M5S 1A1, Canada] The spore of a myxosporidan parasite from the liver of a common shiner, /Notropis cornutus/, from Lake Sasajewan, Algonquin Park, is described from phase photomicrographs of fresh specimens. Histochemical and scanning electron microscopic study revealed the presence and distribution of a mucus-like material on the surface of the spores. The dimensions and morphology of the spore are similar to those given for /Myxosoma notropis/ which was described from a similar location in /N. cornutus/ from Quebec.

78-001960 Dykova, I.; Lom, J. HISTOPATHOLOGICAL CHANGES IN FISH GILLS INFECTED WITH MYXOSPORIDIAN PARASITES OF THE GENUS /HENNEGUYA/. J. Fish Biol. 12 (3): 197-202. Mar. 1978. SFA 23(3)

[Inst. Parasitol., Czech. Acad. Sci., Prague, Czechoslovakia] Tissue reaction to invasion by two /Henneguya/ species was studied in gills of three species of fish. /Henneguya psorospermica/ and /Henneguya creplini/ develop in secondary lamellar arterioles in perch (/Perca fluviatilis/) and ruff (/Acerina cernua/). In pike (/Esox lucius/), /H. psorospermica/ develops in the artery. During the growth of the vegetative stage, the gill tissue may undergo local atrophy or hyperplasia of the epithelium and displacement and disfiguration of the lamellae. After the myxosporidian cyst, surrounded by a host tissue capsule has reached maturity and contains fully-formed spores, an inflammatory reaction may set in which reduces the cyst to granulomatous tissue. This inflammatory process is essentially of the same type as that observed in mammals. There is evidence that inflammatory responses are of regular occurrence in the final stages of most myxosporidian infections. Transfer from low to room temperature provokes a rapid elimination of the cysts by granulomatous inflammation.

78-001961 Dykova, I.; Lom, J. TISSUE REACTION OF THE THREE-SPINED STICKLEBACK /GASTEROSTEUS ACULEATUS/ L. TO INFECTION WITH /GLUGEA ANOMALA/ (MONIEZ, 1887). J. Fish Dis. 1 (1): 83-90. Jan 1978. SFA 23(3)

[Inst. Parasitol., Czech. Acad. Sci., Flemingovo nam. 2, 160 00 Praha 6, Czechoslovakia] Studies on an experimental infection of the stickleback (/Gasterosteus aculeatus/ L.) with the microsporidian /Glugea anomala/ conducted until day 126 post infection confirmed that xenoparasitic formations typical of the intracellular development of this microsporidian were responsible for a marked tissue reaction in the host. After a single oral infection, xenoparasitic formations developed in the subepithelial connective tissue of the glandular part of the stomach. The course of xenoma development was asynchronous. Up to the 'cyst' stage (xenomas filled with mature spores), their growth and development caused a pressure atrophy in the surrounding tissue. Later, the response to the pressure of the xenoparasitic formation was the development of a granulomatous inflammatory reaction. Locally, the host responded to the infection by phagocytosis of mature spores by locally derived macrophages. In massive infections, changes occurred in the subepithelial connective tissue of the glandular part of the stomach (often the complete disappearance of tubular glands), which may result in a permanent influence on the function of this organ.

78-001962 Ferguson, H. W.; Needham, E. A. PROLIFERATIVE KIDNEY DISEASE IN RAINBOW TROUT /SALMO GAIRDNERI/ RICHARDSON. J. Fish Dis. 1 (1): 91-108. Jan. 1978. SFA 23(3)

[Vet. Res. Lab., Stormont, Belfast BT4 3SD, Northern Ireland] Two entirely separate outbreaks of PKD are described in an attempt to properly define the condition and enable it to be differentiated from other diseases of a similar nature. Losses of up to 75 percent of fingerling rainbow trout were recorded in one outbreak, illustrating the potentially serious nature of the disease. Although the kidneys showed the most obvious pathological changes, other organs were also affected. The host response was granulomatous in type, the foci of each cellular reaction being 5-20 um eosinophilic cells considered to be parasitic. The cytoplasm of these cells contained numerous electron dense bodies some with a tail, but each with an electron lucent bar always orientated at right angles to the plasmalemma whenever they were near it. The most obvious cytoplasmic inclusion of these 'parasites' were other cells numbering up to five or six, each with

78-001962 CONTINUED
its own nucleus and nucleolus, but devoid of any of the small electron dense bodies. The significance of either of these inclusions is unknown. A limited differential diagnosis is given, and the argument presented that the conditon PKD is the result of infection by a parasite, possibly an amoeba, in combination with poor quality water.

78-001963 Heckmann, R. A.; Jensen, L. A. THE HISTOPATHOLOGY AND PREVALENCE OF /HENNEGUYA SEBASTA/ AND /KUDOA CLUPEIDAE/ IN THE ROCKFISH, /SEBASTES PAUCISPINIS/ OF SOUTHERN CALIFORNIA. J. Wildl. Dis. 14 (2): 259-262. Apr. 1978. SFA 23(3)
[Dep. Zool., Brigham Young Univ., Provo, UT 84602] The pathogenesis of two histozoic myxosporidans, /Henneguya sebasta/ and /Kudoa clupeidae/, was studied from the Pacific rockfish, /Sebastes paucispinis/. Infection of the bulbus and truncus arteriosus with /H. sebasta/ was observed in 30 of 100 fish. The parasite metastasized throughout the tissue causing necrosis, hyperplasia and hypertrophy of the connective tissue and smooth muscle. /K. clupeidae/, found in 37 of 100 fish, caused necrosis and atrophy of host skeletal muscle. The unattractive appearance of /Kudoa/ cysts in rockfish filets detracted from their commercial value.

78-001964 Khan, R. A. A NEW HEMOGREGARINE FROM MARINE FISHES. J. Parasitol. 64 (1): 35-44. Feb. 1978. SFA 23(3)
[Dep. Biol., Memorial Univ., St. John's, NF A1C 5S7, Canada]

78-001965 Markiw, M. E.; Wolf, K. /MYXOSOMA CEREBRALIS/: FLUORESCENT ANTIBODY TECHNIQUES FOR ANTIGEN RECOGNITION. J. Fish. Res. Board Can. 35 (6): 828-832. June 1978. In English with French summ. SFA 23(3)
[U.S. FWS, Natl. Fish Health Res. Lab., Kearneysville, WV 25430]

78-001966 Mitchell, L. G. MYXOSPORIDAN INFECTIONS IN SOME FISHES OF IOWA. J. Protozool. 25 (1): 100-105. Feb. 1978. SFA 23(3)
[Dep. Zool., Iowa State Univ., Ames 50011]

78-001967 Nagel, M. L.; Summerfelt, R. C. APPARENT IMMUNITY OF GOLDFISH TO /PLEISTOPHORA OVARIAE/. Proc. Okla. Acad. Sci. 57: 61-63. 1977. SFA 23(3)
Okla. Coop. Fish. Res. Unit, Okla. State Univ., Stillwater] Examination of histological sections of young-of-the-year and adult goldfish, /Carassius auratus/, exposed to /Pleistophora ovariae/, a microsporidan parasite that occurs in the ovaries of golden shiners (/Notemigonus crysoleucas/), revealed no infections. Although the parasite is nearly ubiquitous in golden shiners and has recently been found in the fathead minnow (/Pimephales promelas/), we could not find it in samples of goldfish from a commercial source with known infections of shiners. Intraperitoneal and intramuscular injection of goldfish with 1.9 to 3.9 x 10^4 /P. ovariae/ spores did not result in transmission of the parasite.

78-001968 Nakajima, K.; Egusa, S. /KUDOA PERICARDIALIS/ N.SP. (MYXOSPORIDEA: CHLOROMYXIDAE) FROM CULTURED YELLOWTAIL, /SERIOLA QUINQUERADIATA/ TEMMINCK ET SCHLEGEL. Bull. Jpn. Soc. Sci. Fish. 44 (2): 117-120. Feb. 1978. SFA 23(3)
[Cent. Res. Lab., Sankayo Co., Shinagawa, Tokyo, Japan] /Kudoa pericardilais/ n.sp. (Myxosporidea: Chloromyxidae) was described from the pericardial cavity of cultured yellowtails, /Seriola quinqueradiata/ Temminck et Schlegel, in farms in Ajiro Bay, Shizuoka prefecture. Trophozoites were ellipitical, oval or irregular and were free in the cavity or enveloped with membraneous tissues proliferated on the surface of the heart and the cavity wall. Spores were quardrilateral in polar view and were characterized by the four elongated polar capsules. The existence of the polar plate and the polar lid was demonstrated with the scanning electron microscope.

78-001969 Nepszy, S. J.; Budd, J.; Dechtiar, A. O. MORTALITY OF YOUNG-OF-THE-YEAR RAINBOW SMELT (/OSMERUS MORDAX/) IN LAKE ERIE ASSOCIATED WITH THE OCCURRENCE OF /GLUGEA HERTWIGI/. J. Wildl. Dis. 14 (2): 233-239. Apr. 1978. SFA 23(3)
[Fish. Res. Stn., Ontario Minist. Nat. Resour., R.R. 1, Wheatley, ON NOP 2P0, Canada] an extensive mortality of young-of-the-year rainbow smelt (/Osmerus mordax/) occurred in Lake Erie during the fall of 1969. Dead and dying smelt were observed along the north shore from west of Long Point in the central basin to Port Maitland in the eastern basin. No other fish species was involved. /Glugea hertwigi/, a microsporidan parasite, was observed in 90 percent of the distressed smelt examined, and is believed to have been a major contributing factor to the mortality.

78-001970 Taylor, R. L.; Lott, M. TRANSMISSION OF SALMONID WHIRLING DISEASE BY BIRDS FED TROUT INFECTED WITH /MYXOSOMA CEREBRALIS/. J. Protozool. 25 (1): 105-106, Feb. 1978. SFA 23(3)
[Div. Vet. Med., 5305 Mill St., Univ. Nevada, Reno 89502]

78-001971 Wold, D.; Iversen, E. S. /MYXOBOLUS LATIPINNACOLA/ NEW SPECIES (MYXOSPORIDA) FROM THE SAILFIN MOLLY, /POECILIA LATIPINNA/ (LESUEUR) IN SOUTH FLORIDA. Bull. Mar. Sci. 28 (2): 376-380. Apr. 1978. SFA 23(3)
[Rosensteil Sch. Mar. Atmos. Sci., Univ. Miami, 4600 Rickenbacker Causeway, Miami, FL 33149]

VIRAL DISEASES

78-001972 Duncan, I. B. EVIDENCE FOR AN ONCOVIRUS IN SWIMBLADDER FIBROSARCOMA OF ATLANTIC SALMON /SALMO SALAR/ L. J. Fish Dis. 1 (1): 127-131. Jan. 1978. SFA 23(3)
[Div. Rheumatol., Clinical Res. Cent., Watford Rd., Harrow, Middlesex HA1 3UJ, England]

78-001973 Elliott, D. G.; Amend, D. F. EFFICACY OF CERTAIN DISINFECTANTS AGAINST INFECTIOUS PANCREATIC NECROSIS VIRUS. J. Fish Biol. 12 (4): 277-286. Apr. 1978. SFA 23(3)

[Tavolek, Inc., 2779-152nd Ave., N.E., Redmond, WA 98052] The virucidal properties of iodophor, chlorine (sodium hypochlorite), formalin, thimerosal (organic mercurial compound), malachite green, and acriflavine were tested on infectious pancreatic necrosis virus (IPNV). Iodine and chlorine showed good activity, but efficacy depended on the concentration of virus, the presence of organic matter (calf serum), and water pH. Water hardness (0-300 mg l^{-1} as CaCO(3)) did not affect virucidal activity. In a 5 mon exposure, 4 mg l^{-1} available iodine inactivated 10 to the 3.9 TCID(50) ml^{-1} IPNV but 16 mg l^{-1} iodine were needed for inactivation of 10 to the 6.3 TCID(50) ml^{-1}. The addition of 0.5 percent calf serum significantly reduced the iodine concentration and the virucidal activity. In comparison, 4 mg l^{-1} chlorine were needed to inactivate 10 to the 4.5 TCID(50) ml^{-1} IPNV in 5 min. However, the addition of 0.07 percent serum greatly reduced the chlorine concentration and extended the virucidal contact time to 30 min or more. IPNV at 10 to the 6.3 TCID(50) ml^{0} was not inactivated by exposures for 60 min to 0.2 percent formalin, 10 min to 0.2 percent thimerosal, 60 min to 5 mg l^{0} malachite green, or 20 min to 500 mg l^{0} acriflavine. However, acriflavine at 0.5 mg l^{0} in cell culture media prevented the development of cytopathology caused by IPNV and may be useful in the treatment of the disease.

78-001974 Evelyn, T. P. T.; Traxler, G. S. VIRAL ERYTHROCYTIC NECROSIS: NATURAL OCCURRENCE IN PACIFIC SALMON AND EXPERIMENTAL TRANSMISSION. J. Fish. Res. Board Can. 35 (6): 903-907. June 1978. In English with French summ. SFA 23(3)

[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

78-001975 Ghittino, P.; Beccaria, F. ACTUAL ECOLOGICAL PROBLEMS IN THE VIRAL HAEMORRAGIC SEPTICAEMIA OF RAINBOW TROUT IN ITALY. Bull. Off. Int. Epiz. 87 (5-6): 397-399. 1977. SFA 23(3)

[Ist. Zooprof. Sper., Via Bologna, 148, 10154 Torino, Italy]

78-001976 McIntyre, J. D.; Amend, D. F. HERITABILITY OF TOLERANCE FOR INFECTIOUS HEMATOPOIETIC NECROSIS IN SOCKEYE SALMON (/ONCORHYNCHUS NERKA/). Trans. Am. Fish. Soc. 107 (2): 305-308. Mar. 1978. SFA 23(3)

[U.S. FWS, Box 1050, Tyler Rd., Red Bluff, CA 96080]

78-001977 Reno, P. W. QUALITATIVE AND QUANTITATIVE ASPECTS OF THE INFECTIOUS PANCREATIC NECROSIS VIRUS (IPNV) CARRIER STATE IN TROUT. Ph.D. dissertation, Univ. Guelph (Canada) 1976. From Diss. Abstr. Int. B Sci. Eng. 38(7):3055. Jan. 1978. SFA 23(3)

78-001978 Sinclair, T. F. SOME ASPECTS OF THE ASSOCIATION OF HUMAN ENTEROVIRUSES WITH FRESH WATER FISH. Ph.D. dissertation, Univ. Health Sci. Chicago Med. Sch. 159p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(4):1575. Oct. 1977. SFA 23(3)

Human enteroviruses, poliovirus types 1, 2 and 3 were recovered from the intestinal tracts of fat head minnows following exposure to human fecal pollution. Such viruses could not be recovered from a variety of freshwater fish, including fat head minnows, which inhabited pristine waters. When poliovirus type 1 was experimentally seeded in the water or in the feed used to maintain minnows, the virus could not be recovered from these fish. However, if virus was seeded in human fecal

78-001978 CONTINUED
material and this suspension was added to the environment of the fish, virus was accumulated in their intestinal tracts. Several human enteroviruses were tested for their potential to replicate in numerous established fish cell lines and in primary cell cultures prepared from a variety of species of freshwater fish. While no replication could be demonstrated it was found that all of the enteroviruses strongly adsorbed to the fish cells. This observation, coupled with evidence of long term survival of poliovirus type 1 /in vivo/ may indicate that fish tissues possess receptors for enteroviruses which aid in the accumulation of these viruses when fish are exposed to human pollution.

78-001979 Wedemeyer, G. A.; Nelson, N. C.; Smith, C. A. SURVIVAL OF THE SALMONID VIRUSES INFECTIOUS HEMATOPOIETIC NECROSIS (IHNV) AND INFECTIOUS PANCREATIC NECROSIS (IPNV) IN OZONATED, CHLORINATED AND UNTREATED WATERS. J. Fish. Res. Board Can. 35 (6): 875-879. June 1978. In English with French summ. SFA 23(3)
[Natl. Fish. Res. Cent., Bldg. 204, Naval Support Activity, Seattle, WA 98115]

OTHER DISEASES AND PARASITES

78-001980 Ahmad, J. TWO NEW SPECIES OF DIGENETIC TREMATODES OF FISHES FROM THE BAY OF BENGAL. Neth. J. Zool. 27 (3): 305-309. Sept. 1977. SFA 23(3)
[Dep. Zool., Shibli Natl. Post-Grad. Coll., Azamgarh, Uttar Pradesh, India] Diagnoses are given of the digenetic trematodes /Neohysterolecitha indica/ n. gen., n.sp. and /Opisthomonorcheides indicus/ n.sp. They were collected from the stomach of the fish /Chirocentrus dorab/ (Ruppel) and the intestine of the fish /Apogonichthys ellioti/ (Day), respectively, both from the bay of bengal, off the Puri coast, Orissa, India.

78-001981 Bennet, P. S.; Chellam, A. /PERODERMA TASSELUM/ SP. NOV. (LERNAEOCERIFORMES; COPEPODA) PARASITIC ON THE FISH /STOLEPHORUS COMMERSONII/ LACEPEDE. Indian J. Fish. 22 (1,2): 279-282. 1975. SFA 23(3)
[Tuticorin Res. Cent. C.M.F.R. Inst., Tuticorin, India]

78-001982 Beverley-Burton, M. METAZOAN PARASITES OF ARCTIC CHAR (/SALVELINUS ALPINUS/ L.) IN A HIGH ARCTIC, LANDLOCKED LAKE IN CANADA. Can. J. Zool. 56 (2): 365-368. Feb. 1978. In English with French summ. SFA 23(3)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

78-001983 Bulow, F. J.; Winningham, J. R. INCIDENCE OF OCCURRENCE OF THE COPEPOD PARASITE /LERNAEA CYPRINACAEA/ IN A STREAM FISH POPULATION. J. Tenn. Acad. Sci. 53 (2): 74. Apr. 1978. Abstract only. SFA 23(3)
[Tenn. Tech. Univ., Cookeville] The anchor worm, /Lernaea cyprinacaea/, is a fairly common copepod parasite of fish being particularly problematical in hatcheries and fish farms. Literature concerning the natural occurrence of this parasite in stream fish populations, however, is sparse. In the present study, 15 species of fishes from Blackburn Fork, Putnam County, Tennesse were examined for

78-001983 CONTINUED
this parasite. Incidence of occurrence, degree of infection, and location on the fish body were recorded. Several cyprinids including /Campostoma anomalum/ and /Rhinichthys atratulus/ were particularly susceptible to infection, while other species including /Cottus carolinae/ showed no incidence of infection. The parasite was most often found at the base of a fin, primarily the dorsal fin. The effect of season and stream order on incidence of occurrence was also investigated.

78-001984 Cloutman, D. G. ABUNDANCE OF /CLEIDODISCUS PRICEI/ MUELLER (MONOGENEA: DACTYLOGYRIDAE) ON THE FLAT BULLHEAD, /ICTALURUS PLATYCEPHALUS/ (GIRARD), IN LAKE NORMAN, NORTH CAROLINA. J. Parasitol. 64 (1): 170-172. Feb. 1978. SFA 23(3)
[Environ. Sci. Unit, Duke Power Co., Rt. 3, Box 90, Huntersville, NC 28078]

78-001985 Cone, D. K. SYSTEMATIC POSITION OF /UROCLEIDUS ADSPECTUS/ MUELLER, 1936 (MONOGENEA: ANCYROCEPHALINAE) OF /PERCA FLAVESCENS/. Can. J. Zool. 56 (4): 608-612. Apr. 1978. In English with French summ. SFA 23(3)
[Dep. Biol., Univ. New Brunswick, Fredericton, NB E3B 5A3, Canada]

78-001986 Dobrinskaya, L. A.; Syuzyumova, L. M.; Mikhailichenko, L. V. ROLE OF EXOMETABOLITES IN THE MANIFESTATION OF GENETICALLY INDUCED MELANOMAS IN INTERSPECIFIC HYBRIDS OF THE GENUS /XIPHOPHORUS/. Sov. J. Ecol. (Engl. Transl. Ekologiya) 8 (3): 260-266. May-June 1977. SFA 23(3)
[Inst. Plant Anim. Ecol., Urals Sci. Cent., Acad. Sci. USSR, USSR]
Experiments were conducted to study the influence of "stock water" on the appearance and growth of melanomas in hybrids of the genus /Xiphophorus/. It was established that great resistance to the development of melanomas is characteristic of hybrids of the control group, which were kept under conditions of accumulation of the products of their life activity for 7 months (without changing the water). Regular changing of the water promoted the greatest spread of melanomas, the development of pronounced pathological changes, and an elevated mortality.

78-001987 Dojiri, M. COPEPOD PARASITES OF FISHES FROM THE ORANGE COUNTY SEWER OUTFALL, CALIFORNIA. M.A. thesis, Calif. State Univ. (Long Beach) 309p. 1977. From Masters Abstracts 16(1), Mar. 1978. SFA 23(3)
Benthic trawls were conducted along the Orange County sewer outfall from October, 1975 to August, 1976. A total of 7,091 ectoparasites were recovered from 3,519 sub-sampled fish representing 32 species. A taxonomic study of the parasitic copepods was completed, including descriptions of five new species, redescriptions of six species, descriptions of two hitherto unknown males, and descriptions of five species whose specific identity could not be determined. Records of 12 additional species are also cited. The flatfishes were the most heavily infested with the exception of /Symphurus atricauda/, which was relatively free of metazoan ectoparasites. Parasitic copepod larvae were most abundant in the April and August samples. Miscellaneous parasites collected during the study are discussed.--From abstr.

78-001988 Evans, N. A. THE OCCURRENCE AND LIFE HISTORY OF /ASYMPHYLODORA KUBANICUM/ (PLATYHELMINTHES: DIGENEA: MONORCHIDAE) IN THE WORCESTER-BIRMINGHAM CANAL, WITH SPECIAL REFERENCE TO THE FEEDING HABITS OF THE DEFINITIVE HOST, /RUTILUS RUTILUS/. J. Zool. (Lond.) 184 (2): 143-153. Feb. 1978. SFA 23(3)
[Dep. Appl. Biol., Univ. Cambridge, Cambridge, England]

78-001989 Fickeisen, D. H.; Montgomery, J. C. TOLERANCES OF FISHES TO DISSOLVED GAS SUPERSATURATION IN DEEP TANK BIOASSAYS. Trans. Am. Fish. Soc. 107 (2): 376-381. Mar. 1978. SFA 23(3)
[Battelle Pac. Northwest Lab., Richland, WA 99352]

78-001990 Fischithal, J. H. ALLOMETRIC GROWTH IN THREE SPECIES OF DIGENETIC TREMATODES OF MARINE FISHES FROM BELIZE. J. Helminthol. 52 (1): 29-39. Mar. 1978. SFA 23(3)
[Dep. Biol. Sci., State Univ. N.Y., Binghamton 13901]

78-001991 Frechette, J-L.; Rau, M. E.; Webster, G. F. LES PARASITES DES ANIMAUX SAUVAGES DU QUEBEC. 3. LES HELMINTHES DE LA BARBOTTE BRUNE, /ICTALURUS NEBULOSUS/ DANS LA REGION DU FLEUVE SAINT-LAURENT ET SES PRINCIPAUX AFFLUENTS. [THE PARASITES OF WILD ANIMALS OF QUEBEC. 3. THE HELMINTHS OF THE BROWN BULLHEAD, /ICTALURUS NEBULOSUS/ FROM THE ST. LAWRENCE RIVER REGION AND ITS PRINCIPAL TRIBUTARIES.] Nat. Can. (Que.) 105 (1): 58. Jan.-Feb. 1978. In French. SFA 23(3)
[Ecol. Vet. Ste-Hyacinthe, Ste-Hyacinthe, PQ, Canada]

78-001992 Fusco, A. C. /SPIROCAMALLANUS CRICOTUS/ (NEMATODA): ISOELECTRIC FOCUSING AND SPECTROPHOTOMETRIC CHARACTERIZATION OF ITS HEMOGLOBIN AND THAT OF ITS PISCINE HOST, /MICROPOGONIAS UNDULATUS/. Exp. Parasitol. 44 (2): 155-160. Apr. 1978. SFA 23(3)
[Gulf Coast Res. Lab., Ocean Springs, MS 39564]

78-001993 Fusco, A. C.; Overstreet, R. M. /SPIROCAMALLANUS CRICOTUS/ SP. N. AND /S. HALITROPHUS/ SP. N. (NEMATODA: CAMALLANIDAE) FROM FISHES IN THE NORTHERN GULF OF MEXICO. J. Parasitol. 64 (2): 239-244. Apr. 1978. SFA 23(3)
[Gulf Coast Res. Lab., Ocean Springs, MS 39564]

78-001994 Fustish, C. A.; Millemann, R. E. GLOCHIDIOSIS OF SALMONID FISHES. II. COMPARISON OF TISSUE RESPONSE OF COHO AND CHINOOK SALMON TO EXPERIMENTAL INFECTION WITH /MARGARITIFERA MARGARITIFERA/ (L.) (PELECYPODA: MARGARITANIDAE). J. Parasitol. 64 (1): 155-157. Feb. 1978. SFA 23(3)
[Oreg. Dep. Fish Wildl., Res. Sect., Corvallis 97331] Coho salmon (/Oncorhynchus kisutch/) are more resistant to experimental infection with the glochidia of the freshwater mussel (/Margaritifera margaritifera/) than are chinook salmon (/Oncorhynchus tshawytscha/). Histological sections made at intervals during the infection showed that coho salmon sloughed the parasites from their gills by 4.5 days postinfection, but the parasites remained encysted in the gills of chinook salmon for 12 weeks, when metamorphosis to juvenile mussels was complete. Coho salmon sloughed the parasites by a well-developed hyperplasia. No such pronounced hyperplastic reaction was seen in the gills of chinook salmon.

78-001995 Gibson, D. I.; Bray, R. A. THE AZYGIIDAE, HIRUDINELLIDAE, PTYCHOGONIMIDAE, SCLERODISTOMIDAE AND SYNCOELIIDAE (DIGENEA) OF FISHES FROM THE NORTHEAST ATLANTIC. Bull. Br. Mus. (Nat. Hist.) Zool. 32 (6): 167-245. 24 Nov. 1977. SFA 23(3)
[Dep. Zool., Brit. Mus. (Nat. Hist.) Cromwell Rd., London SW7 5BD, England]

78-001996 Greer, G. J. LIFE HISTORY STUDIES OF THREE DIGENETIC TREMATODES (DIGENEA: CRYPTOGONIMIDAE). Ph.D. dissertation, La. State Univ. Agric. Mech. Coll. 61p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(7):3081. Jan. 1978. SFA 23(3)

78-001997 Ho, J.-S. MARINE FLORA AND FAUNA OF THE NORTHEASTERN UNITED STATES. COPEPODA: CYCLOPOIDS PARASITIC ON FISHES. NOAA Tech. Rep. NMFS Circ. 409. iii + 12p. Feb. 1978. SFA 23(3)
[Dep. Biol., Calif. State Univ., Long Beach 90840] This manual includes an introduction on the general biology, an illustrated key, an annotated systematic list, a selected bibliography, and an index to the 19 species of cyclopoid copepods parasitic on marine fishes of the northeastern United States.

78-001998 Ho, J.-S. PARASITIC COPEPODS OF THE FAMILY CHONDRACANTHIDAE FROM FISHES OF THE SOUTH-EASTERN PACIFIC (CRUSTACEA, COPEPODA). Steenstrupia 4 (13): 157-165. 12 Dec. 1977. SFA 23(3)
[Dep. Biol., Calif. State Univ., Long Beach 90840]

78-001999 Kennedy, C. R. STUDIES ON THE BIOLOGY OF /EUBOTHRIUM SALVELINI/ AND /E. CRASSUM/ IN RESIDENT AND MIGRATORY /SALVELINUS ALPINUS/ AND /SALMO TRUTTA/ AND IN /S. SALAR/ IN NORTH NORWAY AND THE ISLANDS OF SPITSBERGEN AND JAN MAYEN. J. Fish Biol. 12 (2): 147-162. Feb. 1978. SFA 23(3)
[Dep. Biol. Sci., The University, Exeter, England] Samples of /Eubothrium salvelini/ and /E. crassum/ were obtained from resident and migratory /Salvelinus alpinus/ and /Salmo trutta/ and from /S. salar/ at sea from North Norway and the islands of Spitsbergen and Jan Mayen. Scolex dimensions proved an unsuitable character for identifying these two parasite species, and use of alternative characters confirmed that /E. salvelini/ is specific to /Salvelinus/ and /E. crassum / to /Salmo/. Distributions of both species are co-extensive with their hosts, but levels of infection in any locality relate to the abundance of zooplankton. /E. salvelini/ exhibits seasonal maturation and incidence cycles in char. It is recognised as being a freshwater parasite, although some individuals can survive the period of marine migration of sea char. Returning migrant char may contain such individuals together with small plerocerciform parasites acquired almost immediately upon their re-entry to freshwater. No evidence for marine infections with /E. salvelini/ was found. The presence of plerocerciform and gravid adult /E. crassum/ in salmon caught at sea confirms the existence of a marine life cycle and a marine race in this species. In salmon moving from one medium to the other the marine and freshwater races replace each other, but in sea trout, which spend shorter periods at sea, complete replacement may not occur and at any one time fish may harbour individuals of both races. Recognition of the existence of two races clarifies much of the confusion surrounding the biology of this species.

78-002000 Kritsky, D. C.; Noble, E. R.; Moser, M. /ALIENCOTYLA PRICEI/ SP. N. (MICROCOTYLOIDEA: HETERAXINIDAE) FROM THE GILLS OF THE PILE SURFPERCH, /DAMALICHTHYS VACCA/ (GIRARD), IN SOUTHERN CALIFORNIA. J. Parasitol. 64 (1): 45-48. Feb. 1978. SFA 23(3)
[Coll. Health-Related Prof., Idaho State Univ., Pocatello 83209]

78-002001 MacDonald, S.; Jones, A. EGG-LAYING AND HATCHING RHYTHMS IN THE MONOGENEAN /DIPLOZOON HOMOION GRACILE/ FROM THE SOUTHERN BARBEL (/BARBUS MERIDIONALIS/). J. Helminthol. 52 (1): 23-28. Mar. 1978. SFA 23(3)
[Dep. Zool. Comp. Physiol., Univ. Birmingham, P.O. Box 363, Birmingham, England]

78-002002 Madhavi, R. LIFE HISTORY OF /ALLOCREADIUM FASCIATUSI/ KAKAJI, 1969 (TREMATODA: ALLOCREADIIDAE) FROM THE FRESHWATER FISH /APLOCHEILUS MELASTIGMA/ MCCLELLAND. J. Helminthol. 52 (1): 51-59. Mar. 1978. SFA 23(3)
[Dep. Zool., Andhra Univ., Waltair 530003, India]

78-002003 Malvestuto, S. P.; Ogambo-Ongoma, A. OBSERVATIONS ON THE INFECTION OF /TILAPIA LEUCOSTICTA/ (PISCES: CICHLIDAE) WITH /CONTRACAECUM/ (NEMATODA: HETEROCHEILIDAE) IN LAKE NAIVASHA, KENYA. J. Parasitol. 64 (2): 383-384. Apr. 1978. SFA 23(3)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830]

78-002004 McKnight, I. J. SARCOMA OF THE SWIM BLADDER OF ATLANTIC SALMON (/SALMO SALAR/ L.). Aquaculture 13 (1): 55-60. Jan. 1978. SFA 23(3)
[Mar. Lab., Aberdeen, Scotland] A neoplastic disease of the swim bladder of farmed Atlantic salmon (/Salmo salar/ L.) was investigated. The tumour was classified as a leiomyosarcoma and had a detected prevalence of 4.6 percent of population of 500 second-year sea fish.

78-002005 Orias, J. D.; Noble, E. R.; Alderson, G. D. PARASITISM IN SOME EAST ATLANTIC BATHYPELAGIC FISHES WITH A DESCRIPTION OF /LECITHOPHYLLUM IRELANDEUM/ SP. N. (TREMATODA). J. Parasitol. 64 (1): 49-51. Feb. 1978. SFA 23(3)
[Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106]

78-002006 Peters, N.; Peters, G.; Stich, H. F.; Acton, A. B.; Bresching, G. ON DIFFERENCES IN SKIN TUMOURS OF PACIFIC AND ATLANTIC FLATFISH. J. Fish Dis. 1 (1): 3-25. Jan. 1978. SFA 23(3)
[Zool. Inst., Univ. Hamburg, Hamburg, West Germany] Pacific flatfish from North American and Japanese coastal waters regularly manifest skin tumours. These are generally papillomas, which develop from primary inflammatory nodules (vascularized nodules) on fish of a few month's age. Inside the epidermal part of the tumour slightly dedifferentiated malpighian cells change to rounded enlarged cells showing evidence of considerable degeneration (vacuolization and destruction of the cell organelles). These 'X-cells', which compose the major part of the mature tumour, always remain characteristically separated from the surface, from the basal lamina, and from each other, by non-enlarged 'envelope cells'. Oval, similarly degenerate cells also occur in the tumour stroma, especially in the nodule-like pre-papillomatous stages and here they originate apparently from fibroblasts. In the Atlantic, on the other hand, skin papillomas and other neoplastic skin growths occur relatively infrequently. The skin

78-002006 CONTINUED
papillomas of Atlantic flatfish are considerably less complex. They belong to the relatively simple type which predominates in fishes in general--hyperplastic epidermal papillae which are supported and nurtured by branched folds of the dermal tissue (stroma). Considering the close relationship between the Pacific and Atlantic flatfishes, the distincitve structure of the skin tumours of Pacific fish is considered to be due probably to the influence of a specific virus.

78-002007 Riley, D. M. PARASITES OF GRASS CARP AND NATIVE FISHES IN FLORIDA. Trans. Am. Fish. Soc. 107 (1): 207-212. Jan. 1978. SFA 23(3)
[Dep. Nat. Resour., Bur. Aquatic Plant Res. Control, 202 Blount St., Tallahassee, FL 32304]

78-002008 Rousset, V.; Raibaut, A.; Manier, J.-F.; Coste, F. REPRODUCTION ET SEXUALITE DES COPEPODES PARASITES DE POISSONS. I. L'APPAREIL REPRODUCTEUR DE /CHONDRACANTHUS ANGUSTATUS/ HELLER, 1865; ANATOMIE, HISTOLOGIE ET SPERMIOGENESE. [REPRODUCTION AND SEXUALITY OF PARASITIC COPEPODS OF FISHES. I. THE REPRODUCTIVE APPARATUS OF /CHONDRACANTHUS ANGUSTATUS/ HELLER, 1865: ANATOMY, HISTOLOGY, AND SPERMIOGENESIS.] Z. Parasitenkd. 55 (1): 73-89. 1978. In French with English summ. SFA 23(3)
[Lab. Ichthyol. Parasitol. Gen., Univ. Sci. Tech. Languedoc, F-34060 Montpellier Cedex, France]

78-002009 Sullivan, J. R. THE TREMATODE PARASITES OF THE BLACK BASSES (/MICROPTERUS/ SPECIES) OF THE SOUTHEASTERN UNITED STATES WITH SOME SEASONAL AND LOCATIONAL VARIATIONS OF DIGENEAN POPULATIONS IN LARGEMOUTH BASS (/MICROPTERUS SALMOIDES/). Ph.D. dissertation, Auburn Univ. 285p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(5):1972. Nov. 1977. SFA 23(3)

78-002010 Thomas, M. M.; Devaraj, M. TWO NEW SPECIES OF /ARGULUS/ MULLER (CRUSTACEA: BRANCHIURA) FROM RIVER CAUVERY WITH A KEY TO INDIAN SPECIES. Indian J. Fish. 22 (1,2): 215-220. 1975. SFA 23(3)
[Cent. Mar. Fish. Res. Inst. Reg. Cent., Mandapam Camp, India]

78-002011 Wannamaker, A. W.; Runey, M. W. A STUDY OF TWO NEMATODES FROM THE SUBCUTANEOUS TISSUES OF THE ORAL CAVITY OF /MICROPTERUS SALMOIDES/. Bull. S.c. Acad. Sci. 40: 90-91. 1978. Abstract only. SFA 23(3)
[Dep. Biol., Coll. Charleston, Charleston, SC]

78-002012 Weitkamp, D. E. GAS BUBBLE DISEASE OF RESIDENT FISH AND JUVENILE SALMONIDS IN THE COLUMBIA RIVER SYSTEM. Ph.D. dissertation, Univ. Wash. 253p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(9): 4115. Mar. 1978. SFA 23(3)

78-002013 Williams, D. D. /BIACETABULUM OREGONI/ SP. N. (CESTODA: CARYOPHYLLAEIDAE) FROM /CATOSTOMUS MACROCHEILUS/. Iowa State J. Res. 52 (4): 397-400. May 1978. SFA 23(3)
[1924 19th Ave., Bloomer, WI 54724]

78-002014 Williams, D. D. A KEY TO CARYOPHYLLIDEAN CESTODES OF IOWA FISHES. Iowa State J. Res. 52 (4): 401-409. May 1978. SFA 23(3)
[1924 19th Ave., Bloomer, WI 54724]

78-002015 Wootten, R. THE OCCURRENCE OF LARVAL ANISAKID NEMATODES IN SMALL GADOIDS FROM SCOTTISH WATERS. J. Mar. Biol. Assoc. U.K. 58 (2): 347-356. May 1978. SFA 23(3)
[Mar. Lab., Victoria Rd., Aberdeen AB9 8DB, Scotland

POLLUTION

78-002016 Allen, M. J. POLLUTION RELATED ALTERATIONS OF SOUTHERN CALIFORNIA DEMERSAL FISH COMMUNITIES. Cal-Neva Wildl. Trans. 1977: 103-107. 1977. Copies available from The Wildlife Society, 4606 San Marino Drive, Davis, CA 95616. SFA 23(3)
[South. Calif. Coast. Water Res. Proj., El Segundo] Demersal fish communities in southern California show altered trophic structure, diversity, and species composition near wastewater discharge pipes. Although one recurrent group is attracted to the pipe, others lose some species or feeding types in outfall areas. Species feeding types on polychaetes or plankton are often more abundant, whereas species feeding on small epibenthic crustaceans are frequently absent. A fin erosion disease found in Dover sole (/Microstomus pacificus/) living near outfalls suggest toxic or irritational properties of the sediments. Outfall pipes attract hard bottom and schooling species that prey upon softbottom species.

78-002017 Anderson, D.; Thatcher, T. CONTRASTS BETWEEN CHLORINATION EFFECTS IN FRESHWATER AND SALTWATER ENVIRONMENTS. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 324-325. July 1977. SFA 23(3)
[Battelle Pac. Northwest Lab., Richland, WA]

78-002018 Atlas, R. M.; Horowitz, A.; Busdosh, M. PRUDHOE CRUDE OIL IN ARCTIC MARINE ICE, WATER, AND SEDIMENT ECOSYSTEMS: DEGRADATION AND INTERACTIONS WITH MICROBIAL AND BENTHIC COMMUNITIES. J. Fish. Res. Board Can. 35 (5): 585-590. May 1978. In English with French summ. SFA 23(3)
[Dep. Biol., Univ. Louisville, Louisville, KY 40208]

78-002019 Boehm, P. D. THE TRANSPORT AND FATE OF HYDROCARBONS IN BENTHIC ENVIRONMENTS. Ph.D. dissertation, Univ. R.I. 193p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(4):1503. Oct. 1977. SFA 23(3)

78-002020 Brinkhurst, R. O. ,(ed.) REPORT ON OCEAN DUMPING R AND D PACIFIC REGION FISHERIES AND ENVIRONMENT CANADA 1976-1977. Fish. Environ. Can. Inst. Ocean Sci. Pac. Mar. Sci. Rep. 78-9. iii + 32p. 1978. SFA 23(3)
[Inst. Ocean Sci., Patricia Bay, P.O. Box 6000, Sidney, BC V8L 4B2, Canada] This report summarizes the progress and results of the 1976-77 studies contracted in support of Ocean Dumping legislation and reviews a workshop held for this purpose on May 30-31, 1977 at the Institute of Ocean Sciences, Partricia Bay, Sidney, B.C.

78-002021 Butler, J. N.; Levy, E. M. LONG-TERM FATE OF PETROLEUM HYDROCARBONS AFTER SPILLS--COMPOSITIONAL CHANGES AND MICROBIAL DEGRADATION. J. Fish. Res. Board Can. 35 (5): 604-605. May 1978. In English with French summ. SFA 23(3)
[Div. Appl. Sci., Harvard Univ., Cambridge, MA 02138]

78-002022 Calamari, D. SELECTED BIBLIOGRAPHY ON STUDIES AND RESEARCH RELEVANT TO POLLUTION IN THE MEDITERRANEAN. FAO Fish. Tech. Pap. No. 165. v + 93p. Jan. 1977. In English and French. SFA 23(3)
[FAO of the UN, Rome, Italy]

78-002023 Castro, H. T. UPTAKE AND DISTRIBUTION OF TECHNETIUM-99 BY CHANNEL CATFISH /ICTALURUS PUNCTATUS/ (RAFINESQUE). Ph.D. dissertation, Purdue Univ. 105p. 1975. From Diss. Abstr. Int. B Sci. Eng. 38(8):3613. Feb. 1978. SFA 23(3)
As a result of this experiment it was concluded that channel catfish concentrates Tc-99 taken directly from the water. Although the concentration factors seemed to be relatively low, there is the possibility of being higher in the natural environment and where the food chain is also involved. Based on present discharges of Tc-99m from nuclear medicine applications, Tc-99 in fish does not constitute a significant radiation health hazard to man.

78-002024 Caviglia, A.; Cugurra, F. FURTHER STUDIES ON THE MERCURY CONTENTS IN SOME SPECIES OF MARINE FISH AND MOLLUSCS. Bull. Environ. Contam. Toxicol. 19 (5): 528-537. May 1978. SFA 23(3)
[Ecol. Res. Group, Univ. Inst. Pharmacol., Fac. Phar., Via Capo S. Chiara 5, 16146-Genova, Italy]

78-002025 Clark, R. C., Jr.; Patten, B. G.; DeNike, E. E. OBSERVATIONS OF A COLD-WATER INTERTIDAL COMMUNITY AFTER 5 YEARS OF A LOW-LEVEL, PERSISTANT OIL SPILL FROM THE /GENERAL M.C. MEIGS/. J. Fish. Res. Board Can. 35 (5): 754-765. May 1978. In English with French summ. SFA 23(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

78-002026 Cole, T. J. PRELIMINARY ECOLOGICAL-GENETIC COMPARISION BETWEEN UNPERTURBED AND OIL-IMPACTED /UROSALPINX CINEREA/ (PROSOBRANCHIA: GASTROPODA) POPULATIONS: NOBSKA POINT (WOODS HOLE) AND WILD HARBOR (WEST FALMOUTH), MASSACHUSETTS. J. Fish. Res. Board Can. 35 (5): 624-629. May 1978. In English with French summ. SFA 23(3)
[Boston Univ. Mar. Prog., Mar. Biol. Lab., Woods Hole, MA 02543]

78-002027 Colwell, R. R.; Mills, A. L.; Walker, J. D.; Garcia-Tello, P.; Campos-P., V. MICROBIAL ECOLOGY STUDIES OF THE /METULA/ SPILL IN THE STRAITS OF MAGELLAN. J. Fish. Res. Board Can. 35 (5): 573-580. May 1978. In English with French summ. SFA 23(3)
[Dep. Microbiol., Univ. Md., College Park 20742]

78-002028 Cretney, W. J.; Wong, C. S.; Green, D. R.; Bawden, C. A. LONG-TERM FATE OF A HEAVY FUEL OIL IN A SPILL-CONTAMINATED B.C. COASTAL BAY. J. Fish. Res. Board Can. 35 (5): 521-527. May 1978. In English with French summ. SFA 23(3)
[Inst. Oceanogr., Univ. British Columbia, Vancouver, BC, Canada]

78-002029 Dillon, P. J.; Jefferies, D. S.; Snyder, W.; Reid, R.; Yan, N. D.; Evans, D.; Moss, J.; Scheider, W. A. ACIDIC PRECIPITATION IN SOUTH-CENTRAL ONTARIO: RECENT OBSERVATIONS. J. Fish. Res. Board Can. 35 (6): 809-815. June 1978. In English with French summ. SFA 23(3)
[Limnol. Toxicol. Sect., Ontario Minist. Environ., Rexdale, ON M9W 5L1, Canada]

78-002030 Fey, J. M. DIE AUFHEIZUNG EINES MITTELGEBIRGSFLUSSES UND IHRE AUSWIRKUNGEN AUF DIE ZOOZOENOSE--DARGESTELLT AN DER LENNE (SAUERLAND). [THE HEATING OF A MOUNTAIN STREAM AND THE EFFECTS ON THE ZOOCOENOSIS DEMONSTRATED ON THE LENNE (SAUERLAND).] Arch. Hydrobiol. Supplementb. 53 (3): 307-363. 1977. In German with English summ. SFA 23(3)
[Inst. Spez. Zool., Ruhr-Univ. Bochum, West Germany]

78-002031 Fore, P. L. , (ed.) PROCEEDINGS OF THE 1977 OIL SPILL RESPONSE WORKSHOP. U.S. Fish Wildl. Serv. FWS/OBS/77-24. vi + 153p. Sept. 1977. SFA 23(3)
[U.S. FWS, Natl. Coast. Ecosyst. Team, Natl. Space Technol. Lab., NSTL Stn., MS 39529] A collection of papers.--RS

78-002032 Fowler, S. W.; Elder, D. L. PCB AND DDT RESIDUES IN A MEDITERRANEAN PELAGIC FOOD CHAIN. Bull. Environ. Contam. Toxicol. 19 (2): 244-249. Feb. 1978. SFA 23(3)
[Int. Lab. Mar. Radioactivity, Musee Oceanogr., Monaco]

78-002033 Fox, J. L.; Bresonik, P. L.; Keirn, M. A. LAKE DRAWDOWN AS A METHOD OF IMPROVING WATER QUALITY. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-77-005. x + 94p. Jan. 1977. SFA 23(3)
[Univ. Fla., Gainesville 32611] Investigations were made to determine the feasibility of radical drawdown as a restoration technique for Lake Apopka, Florida, a 12,545 hectare lake in central Florida. Field studies showed the lake to be hypereutrophic with continual algal blooms, mats of floating water hyacinths, and a flocculent organic muck bottom rich in interstitial water nutrients. Sediments were dredged from the lake bottom and placed in aquaria, columns, tanks and pools. Following dewatering and varying drying periods, the containers of sediment were refilled. A large number of physical, chemical and biological parameters were monitored before, during and following sediment drying. Results indicate that drawdown improves subsequent refill water quality. In muck sediments, drying causes significant water loss and shrinkage. Loss of organic material is minimal. During and following refill, sediment is colonized by two

78-002033 CONTINUED
macroscopic aquatic plants, /Typha/ (cattail) and the alga, /Chara/. Drying results in only minor chemical changes in muck sediment. Refill water in the pool test simulations has the same or lower nutrient content, lower turbidity, higher dissolved oxygen, lower temperature, fewer algae and a more diverse benthic invertebrate population. Based on these laboratory scale investigations, drawdown appears to be an effective restoration technique for Lake Apopka.

78-002034 Gardner, W. S.; Kendall, D. R.; Odom, R. R.; Windom, H. L; Stephens, J. A. THE DISTRIBUTION OF METHYL MERCURY IN A CONTAMINATED SALT MARSH ECOSYSTEM. Environ. Pollut. 15 (4): 243-251. Apr. 1978. SFA 23(3)
[Skidaway Inst. Oceanogr., P.O. Box 13687, Savannah, GA 31406] Elevated Hg concentrations (less than 1-60 ppm) were found in several components of a salt marsh (/Spartina alterniflora/) ecosystem which had been industrially contaminated with inorganic Hg. Methyl mercury levels were low (less than 0.002 ppm) in sediments and plants, but accouinted for most of the Hg found in tissues of higher organisms.

78-002035 Gilfallan, E. S.; Vandermeulen, J. H. ALTERATIONS IN GROWTH AND PHYSIOLOGY OF SOFT-SHELL CLAMS, /MYA ARENARIA/, CHRONICALLY OILED WITH BUNKER C FROM CHEDABUCTO BAY, NOVA SCOTIA, 1970-76. J. Fish. Res. Board Can. 35 (5): 630-636. May 1978. In English with French summ. SFA 23(3)
[Bowdoin Coll., Mar. Res. Lab., Brunswick, ME 04011]

78-002036 Gordon, D. C., Jr.; Dale, J.; Keizer, P. D. IMPORTANCE OF SEDIMENT WORKING BY THE DEPOSIT-FEEDING POLYCHAETE /ARENICOLA MARINA/ ON THE WEATHERING RATE OF SEDIMENT-BOUND OIL. J. Fish. Res. Board Can. 35 (5): 591-603. May 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

78-002037 Grahl-Nielsen, O.; Staveland, J. T.; Welhelmsen, S. AROMATIC HYDROCARBONS IN BENTHIC ORGANISMS FROM COASTAL AREAS POLLUTED BY IRANIAN CRUDE OIL. J. Fish. Res. Board Can. 35 (5): 615-623. May 1978. In English with French summ. SFA 23(3)
[Inst. Mar. Res., N-5011 Bergen-Nordnes, Norway]

78-002038 Hall, R. A.; Zook, E. G.; Meaburn, G. M. NATIONAL MARINE FISHERIES SERVICE SURVEY OF TRACE ELEMENTS IN THE FISHERY RESOURCE. NOAA Tech. Rep. NMFS SSRF- 721. iii + 313p. Mar. 1978. SFA 23(3)
[NMFS, Regent Dr., Univ. Md. Campus, College Park 20740] Trace element levels have been determined in tissues of 204 species of finfish, Mollusca, and Crustacea taken from 198 sites around the coastal United States, including Alaska and Hawaii. The survey was undertaken as part of the Microconstituents Program of the National Marine Fisheries Service, and covers the occurrence of 15 elements: antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, molybdenum, nickel, selenium, silver, tin, vanadium, and zinc. Total concentrations of each element were determined without regard to chemical form. The species analyzed represent approximately 93 percent of the volume of the U.S. commercial and sportfish catch. The analytical data are summarized in several ways in order to emphasize different aspects of the trace element distributions. Mean levels of each element are presented in relation to the number of species examined, the U.S. (commercial and sportfish) catch, and the

78-002038 CONTINUED
U.S. catch intended for consumption. More detailed analytical data on all 15 elements are given for individual species with reference to tissue analyzed, length and weight of fish, and location of catch. For the most part, experimental results are presented without interpretive comment. Mean levels of mercury, the only element for which a regulatory action level is in force, were found to exceed 0.5 ppm Hg in species representing less than 2 percent of the U.S. catch intended for consumption.

78-002039 Hampson, G. R.; Moul, E. T. NO. 2 FUEL OIL SPILL IN BOURNE, MASSACHUSETTS: IMMEDIATE ASSESSMENT OF THE EFFECTS ON MARINE INVERTEBRATES AND A 3-YEAR STUDY OF GROWTH AND RECOVERY OF A SALT MARSH. J. Fish. Res. Board Can. 35 (5): 731-744. May 1978. In English with French summ. SFA 23(3)
[Woods Hole Oceanogr. Inst., Woods Hole, MA 02543]

78-002040 Hattula, M. L.; Janatuinen, J.; Sarkka, J.; Paasivirta, J. A FIVE-YEAR MONITORING STUDY OF THE CHLORINATED HYDROCARBONS IN THE FISH OF A FINNISH LAKE ECOSYSTEM. Environ. Pollut. 15 (2): 121-139. Feb. 1978. SFA 23(3)
[Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland] The present study, concerning the chlorinated hydrocarbon contents, PCB- and DDT-related compounds in the Finnish inland water fish, was the biggest ever carried out in Finland. During five years 1723 specimens and twelve species were analysed, the material being obtained from Lake Paijanne, the second largest lake in Finland. The lake consists of five limnologically different areas. The results of the study were statistically tested by t-test, one way analysis of variance and regression analysis. The results showed that the average PCB concentration mg/kg on a wet weight basis was 0.056 and total DDT (DDT + metabolites) 0.010, respectively. The concentrations of lindane, aldrin and dieldrin were under 0.0005 mg/kg. The differences between the species were greater than those between the areas. The regression analysis showed that in the commonest fish, pike, perch and bream, mostly no statistically significant differences were observed in the concentrations between different areas and research years.

78-002041 Herricks, E. E.; Cairns, J., Jr. THE EFFECTS OF LIME NEUTRALIZATION OF ACID MINE DRAINAGE ON STREAM ECOLOGY. Presented at 32nd Annu. Conf. Purdue Ind. Waste Conf. 23p. May 1977. SFA 23(3)
[Dep. Civ. Eng., Univ. Ill., Urbana]

78-002042 Keizer, P. D.; Ahern, T. P.; Dale, J.; Vandermeulen, J. H. RESIDUES OF BUNKER C OIL IN CHEDABUCTO BAY, NOVA SCOTIA, 6 YEARS AFTER THE /ARROW/ SPILL. J. Fish. Res. Board Can. 35 (5): 528-535. May 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

78-002043 Kemp, W. M. ENERGY ANALYSIS AND ECOLOGICAL EVALUATION OF A COASTAL POWER PLANT. Ph.D. dissertation, Univ. Fla. 582p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(6):2600. Dec. 1977. SFA 23(3)

78-002044 Krebs, C. T.; Burns, K. A. LONG-TERM EFFECTS OF AN OIL SPILL ON POPULATIONS OF THE SALT-MARSH CRAB /UCA PUGNAX/. J. Fish Res. Board Can. 35 (5): 648-649. May 1978. In English with French summ. SFA 23(3)
[St. Mary's Coll. Md., St. Mary's City 20686]

78-002045 Landry, A. M., Jr. LIFE HISTORY AND SUSCEPTIBILITY OF FISHES IN GALVESTON BAY, TEXAS TO POWER-PLANT COOLING-WATER OPERATIONS. (VOLUMES I AND II). Ph.D. dissertation, Tex. A&M Univ. 577p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(4):1605. Oct. 1977. SFA 23(3)

78-002046 Leppakoski, E. J.; Lindstrom, L. S. RECOVERY OF BENTHIC MACROFAUNA FROM CHRONIC POLLUTION IN THE SEA AREA OFF A REFINERY PLANT, SOUTHWEST FINLAND. J. Fish. Res. Board Can. 35 (5): 766-775. May 1978. In English with French summ. SFA 23(3)
[Inst. Biol., Abo Akademi, SF-20500 Abo, Finland]

78-002047 Lewis, M. A. INFLUENCE OF AN OPEN-PIT COPPER MINE ON THE ECOLOGY OF AN UPPER SONORAN INTERMITTENT STREAM. Ph.D. dissertation, Ariz. State Univ. 122p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(3):1033. Sept. 1977. SFA 23(3)
Copper mining has polluted streams for many years. This is a common problem in Arizona and this study evaluated the effects of a newly developed open-pit mine on the ecology of intermittent Pinto Creek through water quality, biotic surveys, acute bioassays, primary production and metal accumulation studies. The influx of mine effluents temporarily increased suspended solids and heavy metals in the stream and permanently influenced most other chemical parameters. The effects of the suspended solids on the biota overshadowed the importance of all other quality criteria. The survival of the Pinto Creek biota and that of its riparian border will be seriously jeopardized, if not destroyed, under the continuation of present mining operations. Reduced surface flow, heavy metals and sedimentation will destroy most aquatic species dependent upon Pinto Creek for their survival. despite the recent elimination of most effluent input periodic spills continue to convey suspended solids and heavy metals to the stream. Therefore, the effects of settled suspended solids and potentially toxic metal ions will eventually extend the entire length of the stream and irreversibly destroy its ability to support a permanent aquatic flora and fauna.--From abstr.

78-002048 Mackie, P. R.; Hardy, R.; Whittle, K. J. PRELIMINARY ASSESSMENT OF THE PRESENCE OF OIL IN THE ECOSYSTEM AT EKOFISK AFTER THE BLOWOUT, APRIL 22-30, 1977. J. Fish. Res. Board Can. 35 (5): 544-551. May 1978. In English with French summ. SFA 23(3)
[Torry Res. Stn., Abbey Rd., Aberdeen, Scotland]

78-002049 Mann, K. H.; Clark, R. B. LONG-TERM EFFECTS OF OIL SPILLS ON MARINE INTERTIDAL COMMUNITIES. J. Fish. Res. Board Can. 35 (5): 791-795. May 1978. In English with French summ. SFA 23(3)
[Dep. Biol., Dalhousie Univ., Halifax, NS B3H 4J1, Canada]

78-002050 Mayo, D. W.; Page, D. S.; Cooley, J.; Sorenson, E.; Bradley, P.; Gilfillan, E. S.; Hanson, S. A. WEATHERING CHARACTERISTICS OF PETROLEUM HYDROCARBONS DEPOSITED IN FINE CLAY MARINE SEDIMENTS, SEARSPORT, MAINE. J. Fish. Res. Board Can. 35 (5): 552-562. May 1978. In English with French summ. SFA 23(3)
[Dep. Chem., Bowdoin Coll., Brunswick, ME 04011]

78-002051 McCain, J. C.; Coles, S. L.; Peck, J. M., Jr. THE MARINE BIOLOGICAL IMPACT OF THE HONOLULU GENERATING STATION. Univ. Hawaii Sea Grant Tech. Rep. UNIHI-SEAGRANT-TR-76-01. vi + 50p. Sept. 1975. SFA 23(3)
Studies of the effects of the Hawaiian Electric Generating Station on the zooplankton, reef corals, and fishes of Honolulu Harbor, Oahu, Hawaii were made during 1972-73. No distinct detrimental effects attributable to the generating station were revealed by these studies. The macrozooplankton community in the outfall basin more closely resembled communities sampled outside the harbor than elsewhere in the harbor, which receives a variety of pollutants. Differences in distribution and abundance of macrozooplankton were more closely related to depth and temporal differences than to power station discharge. Although reef corals were restricted from the wall directly in the path of the outfall jet plume, the total coverage of live corals in the discharge basin exceeded that of the intake basin and discharge basin coral colonies were generally larger. Negligible coral growth was found anywhere else in the harbor. Fish standing crop in the discharge basin was estimated to be approximately twice that of the intake basin and little movement was noted between the two areas. Standing crop in both basins was generally higher than estimates for tropical and subtropical shallow water areas. No clear comparisons were possible concerning weight per unit length of fishes in the intake versus discharge basins.

78-002052 Minns, C. K.; Kelso, J. R. M.; Hyatt, W. SPATIAL DISTRIBUTION OF NEARSHORE FISH IN THE VICINITY OF TWO THERMAL GENERATING STATIONS, NANTICOKE AND DOUGLAS POINT, ON THE GREAT LAKES. J. Fish. Res. Board Can. 35 (6): 885-892. June 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Great Lakes Biolimnol. Lab., Canada Cent. Inland Waters, Burlington, ON L7R 4A6, Canada]

78-002053 Notini, M. LONG-TERM EFFECTS OF AN OIL SPILL ON /FUCUS/ MACROFAUNA IN A SMALL BALTIC BAY. J. Fish. Res. Board Can. 35 (5): 745-753. May 1978. In English with French summ. SFA 23(3)
[Swedish Water Air Pollut. Res. Inst., IVL Baltic Sea Lab., Studsvik, Pack, S-611 01 Nykoping, Sweden]

78-002054 Oates, D. THE EFFECTS OF BOATING UPON LEAD CONCENTRATIONS IN FISH. Trans. Kans. Acad. Sci. 79: 149-153. 1976. SFA 23(3)
[Nebr. Game Parks Comm., Wildl. Res., Lincoln 68503] The concentration of lead in fish muscle tissue from lakes where boating is heavy and where it is prohibited was measured. The lead levels ranged from less than 0.05 to 1.35 ppm but did not differ significantly between those in the controlled and noncontrolled boating lakes. Lead levels apparently pose no public health hazard.

78-002055 Olsson, M.; Jensen, S.; Reutergard, L. SEASONAL VARIATION OF PCB LEVELS IN FISH--AN IMPORTANT FACTOR IN PLANNING AQUATIC MONITORING PROGRAMS. Ambio 7 (2): 66-69. 1978. SFA 23(3)
[Swedish Mus. Nat. Hist., S-104 05 Stockholm-50, Sweden] To follow trends in levels of accumulating substances, it is necessary to monitor them. In aquatic ecosystems, fish are often chosen as test organisms. Up to now little attention has, however, been paid to the choice of the sampling period, which should of course be a time when the levels are most constant. In order to find out if seasonal variation takes place, the PCB levels in roach from Lake Roxen have been recorded up to 12 times a year during the past seven years. It was found that the levels peaked suddenly in the spring and then decreased rapidly back to a base level. Different explanations for this phenomenon are discussed. The most probable reason is that increasing waterflow in the feeder streams transports polluted river sediment to the lake. Increased activity of the fish during the spawning season in the spring may also play a role. The conclusion must be that any aquatic ecosystem should be monitored when it is most stable, and probably not during the reproduction period of the test species.

78-002056 Owens, E. H. MECHANICAL DISPERSAL OF OIL STRANDED IN THE LITTORAL ZONE. J. Fish. Res. Board Can. 35 (5): 563-572. May 1978. In English with French summ. SFA 23(3)
[Coastal Stud. Inst., La. State Univ., Baton Rouge 70803]

78-002057 Papadopoulou, C.; Kanias, G. D.; Kassimati, E. M. ZINC CONTENT IN OTOLITHS OF MACKEREL FROM THE AEGEAN. Mar. Pollut. Bull. 9 (4): 106-108. Apr. 1978. SFA 23(3)
[Dep. Chem., Nuclear Res. Cent., 'Democritos', Agia Paraskevi Attikis, Athens, Greece] The zinc content in otoliths of the mackerel (/Scomber japonicus colias/) has been determined by instrumental neutron activation analysis. Six groups each of twelve specimens of the same age selected from three areas of the Aegean sea have been analysed. The zinc content was found to be a linear function of the age and body length.

78-002058 Platts, W. S.; Martin, S. B. HYDROCHEMICAL INFLUENCES ON THE FISHERY WITHIN THE MINING AREA OF EASTERN IDAHO. U.S. For. Serv. Intermt. For. Range Exp. Stn. Res. Pap. INT-246. 15p. 1978. SFA 23(3)
[U.S. For. Serv., 316 E. Myrtle St., Boise, ID 83706] Hydrochemical analysis of selected streams in the upper Blackfoot River drainage showed waters in these streams were in a near-natural state, with possible modification from surrounding land uses. Stream hydrochemistry and physical condition of fish indicated the fishery was in good condition. No influences from present phosphate mining was found that threatened fish health or survival. Hydrochemically, the Blackfoot system is capable of producing a good cutthroat trout fishery, but high levels of nutrients probably restrict optimum cutthroat trout populations.

78-002059 Rehwoldt, R. E.; Mastrianni, W.; Kelley, E.; Stall, J. HISTORICAL AND CURRENT HEAVY METAL RESIDUES IN HUDSON RIVER FISH. Bull. Environ. Contam. Toxicol. 19 (3): 335-339. Mar. 1978. SFA 23(3)
[Marist Res. Inst., Marist Coll., Poughkeepsie, NY]

78-002060 Roesijadi, G.; Anderson, J. W.; Blaylock, J. W. UPTAKE OF HYDROCARBONS FROM MARINE SEDIMENTS CONTAMINATED WITH PRUDHOE BAY CRUDE OIL: INFLUENCE OF FEEDING TYPE OF TEST SPECIES AND AVAILABILITY OF POLYCYCLIC AROMATIC HYDROCARBONS. J. Fish. Res. Board Can. 35 (5): 608-614. May 1978. In English with French summ. SFA 23(3)
[Battelle Pac. Northwest Lab., Mar. Res. Lab., Sequim, WA 98382]

78-002061 Sanders, H. L /FLORIDA/ OIL SPILL IMPACT ON THE BUZZARDS BAY BENTHIC FAUNA: WEST FALMOUTH. J. Fish. Res. Board Can. 35 (5): 717-730. May 1978. In English with French summ. SFA 23(3)
[Woods Hole Oceanogr. Inst., Woods Hole, MA 02543]

78-002062 Southward, A. J.; Southward, E. C. RECOLONIZATION OF ROCKY SHORES IN CORNWALL AFTER USE OF TOXIC DISPERSANTS TO CLEAN UP THE /TORREY CANYON/ SPILL. J. Fish. Res. Board Can. 35 (5): 682-706. May 1978. In English with French summ. SFA 23(3)
[Mar. Biol. Assoc., Citadel Hill, Plymouth, England]

78-002063 Stansby, M. E. FLAVORS IN FISH FROM PETROLEUM PICKUP. Mar. Fish. Rev. 40 (1): 13-17. Jan. 1978. SFA 23(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112] All flavors noted in fish resembling petroleum oil are not derived from oil in water. Origins of various flavors found in fish are discussed. Many facts needed to understand the relationships between levels of petroleum in water and in fish and flavor of the fish have not been elucidated. Particularly, there are large discrepancies between reports by different investigators regarding levels of hydrocarbons and resulting flavor intensities. More research is needed to resolve these contradictions.

78-002064 Stewart, J. E.; Marks, L. J. DISTRIBUTION AND ABUNDANCE OF HYDROCARBON-UTILIZING BACTERIA IN SEDIMENTS OF CHEDABUCTO BAY, NOVA SCOTIA, IN 1976. J. Fish. Res. Board Can. 35 (5): 581-584. May 1978. In English with French summ. SFA 23(3)
[Fish Environ. Sci., Res. Br., Dis. Nutr. Sect., Halifax, NS, Canada]

78-002065 Stuart, T. J. LIMITATION OF PRIMARY PRODUCTIVITY IN A SOUTHWESTERN RESERVOIR DUE TO THERMAL POLLUTION. M.S. thesis, North Texas State Univ. 60p. 1977. From Masters Abstracts 16(1), Mar. 1978. SFA 23(3)
Evidence is presented to support the conclusions that (1) North Lake reservoir is less productive, contains lower standing crops of phytoplankton and total organic carbon than other local reservoirs; (2) that neither the phytoplankton nor their instantaneously-determined primary productivity was detrimentally affected by the power plant entrainment and (3) that the effect of the power plant is to cause nutrient limitation of the phytoplankton primary productivity by long-term, subtle, thermally-linked nutrient precipitation activities.

78-002066 Teal, J. M.; Burns, K.; Farrington, J. ANALYSES OF AROMATIC HYDROCARBONS IN INTERTIDAL SEDIMENTS RESULTING FROM TWO SPILLS OF NO. 2 FUEL OIL IN BUZZARDS BAY, MASSACHUSETTS. J. Fish. Res. Board Can. 35 (5): 510-520. May 1978. In English with French summ. SFA 23(3)
[Dep. Biol., Woods Hole Oceanogr. Inst., Woods Hole, MA 02543]

78-002067 Thomas, M. L. H. COMPARISON OF OILED AND UNOILED INTERTIDAL COMMUNITIES IN CHEDABUCTO BAY, NOVA SCOTIA. J. Fish. Res. Board Can. 35 (5): 707-716. May 1978. In English with French summ. SFA 23(3)
[Div. Sci., Univ. New Brunswick, St. John, NB E2L 4L5, Canada]

78-002068 U.S. Environmental Protection Agency PROCEEDINGS OF THE EPA-SPONSORED SYMPOSIUM ON MARINE, ESTUARINE AND FRESH WATER QUALITY. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-76-079. vi + 207p. July 1976. SFA 23(3)
[U.S. EPA, Corvallis Environ. Res. Lab., Corvallis, OR 97330] A collection of 13 papers.--rs

78-002069 van der Schalie, W. H. THE UTILIZATION OF AQUATIC ORGANISMS FOR CONTINUOUS AND AUTOMATIC MONITORING OF THE TOXICITY OF INDUSTRIAL WASTE EFFLUENTS. Ph.D. dissertation, Va. Polytech. Inst. & State Univ. 176p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(9): 4143. Mar. 1978. SFA 23(3)

78-002070 Van Vleet, E. S.; Quinn, J. G. CONTRIBUTION OF CHRONIC PETROLEUM INPUTS TO NARRAGANSETT BAY AND RHODE ISLAND SOUND SEDIMENTS. J. Fish. Res. Board Can. 35 (5): 536-543. May 1978. In English with French summ. SFA 23(3)
[Inst. Mar. Resour., Univ. Calif., La Jolla 92093]

78-002071 Wilson, A. J.; Forester, J. PERSISTENCE OF AROCLOR 1254 IN A CONTAMINATED ESTUARY. Bull. Environ. Contam. Toxicol. 19 (5): 637-640. May 1978. SFA 23(3)
[U.S. EPA, Gulf Breeze, FL 32561]

FISH KILLS

78-002072 Brooker, M. P.; Morris, D. L.; Hemsworth, R. J. MASS MORTALITIES OF ADULT SALMON, /SALMO SALAR/, IN THE R. WYE, 1976. J. Appl. Ecol. 14 (2): 409-417. Aug. 1977. SFA 23(3)
[Llysdinam Field Cent., UWIST, Newbridge-on-Wye, Powys, Wales] The physical, biological and chemical conditions leading to a mass mortality of adult salmon (/Salmo salar/ L.) in the lower reaches of the R. Wye are described. As a result of sunny and low flow conditions during late June 1976, water temperatures increased to a maximum of 27.6° C. and accelerated the decay of substantial plant stands, the growth of which had been enhanced by the prevailing conditions: this resulted in severe deoxygenation of the water. It is concluded that the low oxygen concentration in the water at this time was the principal factor in causing mass mortalities of fish and was probably accentuated by high water temperatures.

78-002073 Durve, V. S.; Rajbanshi, V. K. FISH MORTALITY AND FISHING DURING AN UNPRECEDENTED DRAUGHT IN LAKE PICHHOLA, UDAIPUR. Indian J. Fish. 22 (1,2): 297-299. 1975. SFA 23(3)
[Dep. Zool., Univ. Udaipur, Udaipur, India]

78-002074 Kingsbury, A. P. MORTALITY OF WALLEYE POLLOCK /THERAGRA CHALCOGRAMMA/ IN SOUTHEASTERN ALASKA DURING 1977. Alaska Dep. Fish Game Tech. Data. Rep. No. 36. 8p. 1978. SFA 23(3)
[Alaska Dep. Fish Game, Div. Commer. Fish., Juneau]

78-002075 Konar, S. K. PESTICIDES AND AQUATIC ECOSYSTEMS. Indian J. Fish. 22 (1,2): 80-85. 1975. SFA 23(3)
[Fish. Lab., Dep. Zool., Kalyani Univ., Kalyani, West Bengal, India]

78-002076 Raleigh, R. F.; Bennett, D. H.; Mohn, L. O.; Maughan, O. E. CHANGES IN FISH STOCKS AFTER MAJOR FISH KILLS IN THE CLINCH RIVER NEAR ST. PAUL, VIRGINIA. Am. Midl. Nat. 99 (1): 1-9. Jan. 1978. SFA 23(3)
[U.S. FWS, Fort Collins, CO 80521] Fish populations were sampled during 1973 and 1974 in a section of the Clinch River, near St. Paul, Virginia, that was subjected to chemically induced fish kills in 1967 and 1970. Species composition and relative abundance were compared with those from prekill, postkill, and postkill recovery periods. A slight decrease in number of species and a change in relative abundance were found. Our data support the findings of others that general recovery following fish kills is relatively rapid.

TOXICOLOGY; BIOASSAYS

78-002077 Addison, R. F.; Willis, D. E. THE METABOLISM BY RAINBOW TROUT (/SALMO GAIRDNERII/) OF P,P'-[^{14}C]DDT AND SOME OF ITS POSSIBLE DEGRADATION PRODUCTS LABELED WITH ^{14}C. Toxicol. Appl. Pharmacol. 43 (2): 303-315. Feb. 1978. SFA 23(3)
[Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

78-002078 Allison, D. T.; Hermanutz, R. O. TOXICITY OF DIAZINON TO BROOK TROUT AND FATHEAD MINNOWS. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-77-060. vii + 69p. May 1977. SFA 23(3)
[U.S. EPA, Environ. Res. Lab., Duluth, MN 55804] Average 96-hr LC50's for diazinon under flow-through conditions were 7.8, 1.6, 0.77, and 0.46 mg/l, respectively, for fathead minnows, flagfish, brook trout, and bluegills. The chronic effects of diazinon on fathead minnows and brook trout were determined in flow-through systems with constant toxicant concentrations. Fathead minnows exposed to the lowest concentration tested (3.2 ug/l) from 5 days after hatch through spawning had a significantly higher incidence of scoliosis than the control ($P = 0.05$). Hatch of their progeny was reduced by 30 percent at this concentration. Yearling brook trout exposed to 4.8 ug/l and above began developing scoliosis and lordosis within a few weeks. Growth of brook trout was substantially inhibited during the first 3 months at 4.8 ug/l and above. Neurological symptoms were evident in brook trout at 2.4 ug/l and above early in the tests, but were rarely observed after 4 or 5 months of exposure. Exposure of mature brook

78-002078 CONTINUED
trout for 6-8 months to concentrations ranging from 9.6 ug/l to the lowest tested (0.55 ug/l) resulted in equally reduced growth rates for their progeny. Transfer of progeny between concentrations indicated that effects noted for progeny of both species at lower concentrations were the result of parental exposure alone and not the exposure of progeny following fertilization.

78-002079 Anderson, J. W.; Malins, D. C. PHYSIOLOGICAL STRESSES AND RESPONSE IN CHRONICALLY OILED ORGANISMS. J. Fish. Res. Board Can. 35 (5): 679-680. May 1978. In English with French summ. SFA 23(3)
[Battelle Pac. Northwest Div., Mar. Res. Lab., Sequim, WA 98382]

78-002080 Anderson, J. W.; Riley, R. G.; Bean, R. M. RECRUITMENT OF BENTHIC ANIMALS AS A FUNCTION OF PETROLEUM HYDROCARBON CONCENTRATIONS IN THE SEDIMENT. J. Fish. Res. Board Can. 35 (5): 776-790. May 1978. In English with French summ. SFA 23(3)
[Battelle Pac. Northwest Div., Mar. Res. Lab., Sequim, WA 98382]

78-002081 Anees, M. A. HEPATIC PATHOLOGY IN A FRESH-WATER TELEOST /CHANNA PUNCTATUS/ (BLOCH) EXPOSED TO SUB-LETHAL AND CHRONIC LEVELS OF THREE ORGANOPHOSPHORUS INSECTICIDES. Bull. Environ. Contam. Toxicol. 19 (5): 524-527. May 1978. SFA 23(3)
[Reprint requests to: Dep. Zool., Ind. Univ., Bloomington 47401]

78-002082 Auwarter, A. G. SOME EFFECTS OF TOXAPHENE-METHYL PARATHION INTERACTION ON BLUEGILL SUNFISH, (/LEPOMIS MACROCHIRUS/, RAFINESQUE). Ph.D. dissertation, Univ. Ga. 114p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(7):3061. Jan. 1978. SFA 23(3)
An intermittent-flow proportional diluting system has been designed which is capable of producing sixteen combinations of four levels of each of two toxicants. Acute studies were run at 25-100 percent of the experimentally determined 48-hour LC50's for the individual pesticides; an Additive Index of 0.02 indicated strictly additive toxicity over 48 hours of exposure. The effect of the mixtures on short-term bluegill survival was significantly antagonistic. Where significant interaction was shown for short-term pesticide accumulation, this also was antagonistic. Chronic studies revealed that synergistic interaction developed after 42 days of exposure. Methyl parathion as a main effect produced a significant synergistic effect on toxaphene accumulation in bluegill; toxaphene as a main effect has no effect on methyl parathion accumulation. After 42 days of exposure, a highly significant toxaphene-methyl parathion interaction synergistically affects both toxaphene and methyl paration levels in fish.--From abstr.

78-002083 Barnett, J.; Toews, D. THE EFFECTS OF CRUDE OIL AND THE DISPERSANT, OILSPERSE 43, ON RESPIRATION AND COUGHING RATES IN ATLANTIC SALMON (/SALMO SALAR/). Can. J. Zool. 56 (2): 307-310. Feb. 1978. In English with French summ. SFA 23(3)
[Dep. Biol., Acadia Univ., Wolfville, NS, Canada] Emulsions of Venezuelan crude oil and the dispersant, Oilsperse 43, in both unweathered and artificially weathered forms, increased the coughing rate of post smolt Atlantic salmon (/Salmo salar/ L.) in fresh water at sublethal concentrations ranging from 0.01 to 0.7 toxic units in 12-h tests. Coughing rates increased significantly in what appeared to be a concentration- and time-related basis while respiration rates declined at the higher sublethal levels. At most concentrations tested, there were no significant differences between the

78-002083 CONTINUED
physiological responses in either unweathered or artificially weathered emulsions.

78-002084 Botts, R. P. THE SHORT-TERM EFFECTS OF LEAD ON DOMESTIC AND WILD ANIMALS. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-77-009. v + 30p. Jan. 1977. SFA 23(3)
[U.S. EPA, Corvallis Environ. Res. Lab., Corvallis, OR 97330] Small quantities of lead, a ubiquitous and toxic element, may be found in practically all species of plants and animals. The list of animals, both domestic and wild, reportedly intoxicated by lead is impressive. The sources of lead poisoning vary with species of animals. Lead base paints, used motor oils, spent lead shot and pastures contaminated by lead smelters seemingly have been most often incriminated. The lesions associated with lead intoxication may vary widely both within and between species of animals. Lesions and symptoms of the central nervous system are the most prominent. Toxic levels for various species as reported in the literature vary widely and seemingly a single toxic dose for each species, as yet, has not been definitely established. The diagnosis and treatment of lead intoxication may become laborious and time consuming. Most symptoms reported involve central nervous system dearrangement. Treatment of most clinical cases is disappointing generally because of the acute nature of lead poisoning.

78-002085 Brown, D. A.; Parsons, T. R. RELATIONSHIP BETWEEN CYTOPLASMIC DISTRIBUTION OF MERCURY AND TOXIC EFFECTS TO ZOOPLANKTON AND CHUM SALMON (/ONCORHYNCHUS KETA/) EXPOSED TO MERCURY IN A CONTROLLED ECOSYSTEM. J. Fish. Res. Board Can. 35 (6): 880-884. June 1978. In English with French summ. SFA 23(3)
[Inst. Oceanogr., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

78-002086 Buangsawasdi, M. ORGANOPHOSPHATE INSECTICIDE TOXICITY IN RAINBOW TROUT (/SALMO GAIRDNERI/). EFFECTS OF TEMPERATURE AND INVESTIGATIONS ON THE SITES OF ACTION. Ph.D. dissertation, Univ. Manitoba 1977. From Diss. Abstr. Int. B Sci. Eng. 38(11):5228 May 1978. SFA 23(3)
This study indicates that the cardiovascular and respiratory systems in fish are very important sites of action for OP insecticide toxicity, and that this toxicity depends on physio-chemical properties, e.g. lipid solubility and degree of ionization of the insecticide, and on environmental factors, e.g., temperature.--from abstr.

78-002087 Burton, D. T.; Margrey, S. L. AN EVALUATION OF ACUTE BROMINE CHLORIDE TOXICITY TO GRASS SHRIMP (/PALAEMONETES/ SPP.) AND JUVENILE BLUE CRABS (/CALLINECTES SAPIDUS/). Bull. Environ. Contam. Toxicol. 19 (2): 131-138. Feb. 1978. SFA 23(3)
[Acad. Nat. Sci. Phila., Benedict Estuarine Res. Lab., Benedict, MD 20612]

78-002088 Cairns, J., Jr.; Buikema, A. L., Jr.; Heath, A. G.; Parker, B. C. EFFECTS OF TEMPERATURE ON AQUATIC ORGANISM SENSITIVITY TO SELECTED CHEMICALS. Va. Water Resour. Cent. Bull. 106. viii + 88p. Feb. 1978. SFA 23(3)
[Cent. Environ. Stud., VPI&SU, Blacksburg, VA 24060]

78-002089 Cairns, J., Jr.; Dickson, K. L. FIELD AND LABORATORY PROTOCOLS FOR EVALUATING THE EFFECTS OF CHEMICAL SUBSTANCES ON AQUATIC LIFE. J. Test. Eval. 6 (2): 81-90. 1978. SFA 23(3)
[Cent. Environ. Stud., VPI&SU, Blacksburg, VA 24061]

78-002090 Curby, W. A.; Winick, R. D.; Moy, E. C. ASSAYS OF TOXIC POLLUTANTS BY FISH BLOOD. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-76-069. ix + 67p. Sept. 1976. SFA 23(3)
[Sias Res. Lab., Brookline, MA 02146] We have developed a biological multichannel analyzer which, using a sensor that operates on the Coulter principle, measures and distributes mixed cell populations by cell size. It provides an analog distribution and digital printed readout for future analysis. Although primarily a pulse height analyzer (applied successfully to studying bacteria, mammalian blood and inert particles) it operates as a pulse shape analyzer if the instant at which each pulse height is read is varied. This technique, applied to the peripheral whole blocd from freshly sacrificed /Fundulus heteroclitus/ shows the alterations with time and the variations caused by trace amounts of cadmium and copper in the aquatic environment. The size frequency distribution patterns of each trace element environment differ from each other, and each, markedly from the norm. We have investigated and recorded the response of /F. heteroclitus/ whole blood cells from fishes living in several aquatic environments of fixed pH and dissolved oxygen and temperature. We compared these data with those obtained frcm fish subjected to dissolved traces of chemical pollutants. In final fulfillment of our grant, we have delivered an advanced model of the multichannel analyzer to the U.S. Water Quality Laboratories in Narragansett, Rhode Island. The Fish Blood Analyzer is produced by Grumman Health Systems.

78-002091 Danil'chenko, O. P. THE SENSITIVITY OF FISH EMBRYOS TO THE EFFECT OF TOXICANTS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 455-463. 1977. SFA 23(3)
[Spec. Topics Lab., Moscow Univ., USSR] An investigation was made of the embryonic development of teleosts and sturgeons in solutions of various toxicants and of the reversability of the effect of lethal concentrations of triethyl stannic chloride. It was demonstrated that fish embryos are simultaneously highly resistant to the action of the toxicant and highly sensitive to it. The resistance of fish eggs to the action of toxicants should be understood as the possibility of completing development at relatively high concentrations. The sensitivity of fishes in the embryonic development period to the action of toxicants is manifested as various deviations from the control in embryos, prolarvae and larvae when they develop in nonlethal solutions of a toxicant.

78-002092 Davies, P. H.; Goettl, J. P., Jr.; Sinley, J. R. TOXICITY OF SILVER TO RAINBOW TROUT (/SALMO GAIRDNERI/). Water Res. 12 (2): 113-117. 1978. SFA 23(3)

[Colo. Div. Wildl., P.O. Box 2287, Fort Collins 80522] The mean 96-h LC(50)'s of silver with rainbow trout were 6.5 ug l^{-1} and 13.0 ug l^{-1} in soft water (approximately 26 mg l^{-1} hardness as CaCO(3)) and hard water (350 mg l^{-1} hardness as CaCO(3)), respectively. The long-term, "no effect" concentration for silver, added to the water as silver nitrate, was between 0.09 and 0.17 ug l^{-1} after 18 months exposure in soft water. The "no effect" concentration is that concentration range which defines no observed effect. Based on mortalities different from the control, no mortalities attributable to silver occurred at 0.09 ug Ag l^{-1}, whereas 17.2 percent mortality occured to fish exposed to 0.17 ug l^{-1}. The "no effect" concentration does not reflect possible effects of silver on spawning behavior or reproduction, since female rainbow trout will not generally reach sexual maturity before 3 yr. At silver concentrations of 0.17 ug l^{-1} or greater, silver caused premature hatching of eggs and reduced growth rate in fry. In one experiment, the eggs were completely hatched within 10 days of exposure; whereas, control eggs completed hatching after 42 days. The prematurely erupted fry were not well developed and frequently died. The growth rate of surviving fry was greatly reduced.

78-002093 Dixon, R. N.; Milton, P. THE EFFECTS OF THE ANAESTHETIC QUINALDINE ON OXYGEN CONSUMPTION IN AN INTERTIDAL TELEOST /BLENNIUS PHOLIS/ (L.). J. Fish Biol. 12 (4): 359-369. Apr. 1978. SFA 23(3)

[Dep. Zool., Univ. Sheffield, Western Bank, Sheffield S10 2TN, Yorkshire, England] The effects of the anaesthetic quinaldine on oxygen consumption in an intertidal teleost /Plennius pholis/ (L.) were investigated. Oxygen consumption generally decreases with increasing quinaldine concentration in environmental water. However, at low concentrations, oxygen consumption of smaller specimens is slightly increased. Generally, smaller specimens have their oxygen consumption affected less by a given quinaldine concentration than do larger specimens, as the former appear to be at less depressed stages of anaesthesia. This is thought to be due to smaller /B. pholis/ becoming saturated with quinaldine more rapidly but simultaneously being afforded more rapid removal, because of their greater relative gill area per unit body volume. The reduction of oxygen consumption at high concentrations of quinaldine is great.

78-002094 Domanik, A. M.; Zar, J. H. THE EFFECT OF MALATHION ON THE TEMPERATURE SELECTION RESPONSE OF THE COMMON SHINER, /NOTROPIS CORNUTUS/ (MITCHILL). Arch. Environ. Contam. Toxicol. 7 (2): 193-206. 1978. SFA 23(3)

[J. H. Zar: Dep. Biol. Sci., North. Ill. Univ., DeKalb 60115] Warm- (17°C) and cold-acclimated (8°C) young-of-the-year, 1-year-old, and 2-year-old common shiners, /Notropis cornutus/ (Mitchill) were exposed for 24 hr to sublethal doses (1.0, 0.25, and 0.05 ug/L) of malathion to determine the effect of environmental concentrations of this compound on temperature selection. All three factors studied (acclimation temperature, age, and concentration) were found to affect the temperature selection response of malathion-treated fish. Malathion produced dose-dependent decreases in selected temperature (1.9° to 4.3°C below controls) in 17°C-acclimated fish but not in 8°C-acclimated fish. Two-year-olds treated with 1.0 ug/L displayed the greatest lowering of selected temperature, followed by two-year-olds treated with 0.25 ug/L. One-year-olds treated with 1.0 ug/L showed a slight lowering, while no downward shifts in selected temperature were found for young-of-the-year. Exposure to 0.05 ug/L had no effect on

78-002094 CONTINUED
any age group. Two-year-olds acclimated to 17°C and exposed to 1.0 ug/L malathion for 24 hr were placed in clean water and allowed to recover from the pesticide. It was found that the lowered selected temperature induced by malathion returned to that of the controls in 24 hr.

78-002095 Eldridge, M. B.; Echeverria, T. FATE OF ^{14}C-BENZENE (AN AROMATIC HYDROCARBON OF CRUDE OIL) IN A SIMPLE FOOD CHAIN OF ROTIFERS AND PACIFIC HERRING LARVAE. Cal-Neva Wildl. Trans. 1977: 90-96. 1977. Copies available From The Wildlife Society, 4606 San Marino Drive, Davis, CA 95616. SFA 23(3)
[NMFS, Tiburon, CA] Increased ocean spillage of petroleum hydrocarbons has led scientists to study the uptake accumulation and depuration of specific hydrocarbons in invertebrates and fishes representing different species and trophic levels. This paper presents results of experiments in which newly feeding post-yolk-sac larvae of Pacific herring were exposed to ^{14}C-labeled benzene through water and live food. Larvae had a bimodal response to benzene exposure. Benzene and/or its metabolites were seen to accumulate rapidly (within 6 to 12 hours) from the water to levels approximately 2 times the exposure concentration. When contaminated marine rotifers were present, larvae exhibited a secondary accumulation starting at 24 hours after exposure. Higher average concentration factors of 3.2 were found after 48 hours. These studies showed petroleum hydrocarbons are taken up and accumulated from both water and food, and predators concentrate these hydrocarbons or their metabolites to levels in excess of initial exposure concentrations.

78-002096 Eldridge, M. B.; Echevarria, T.; Korn, S. FATE OF ^{14}C-BENZENE IN EGGS AND LARVAE OF PACIFIC HERRING (/CLUPEA HARENGUS PALLASI/). J. Fish. Res. Board Can. 35 (6): 861-865. June 1978. In English with French summ. SFA 23(3)
[NMFS, Tiburon Lab., Tiburon, CA 94920]

78-002097 FAO of the UN MANUAL OF METHODS IN AQUATIC ENVIRONMENT RESEARCH. PART 4--BASES FOR SELECTING BIOLOGICAL TESTS TO EVALUATE MARINE POLLUTION. FAO Fish. Tech. Pap. No. 164. viii + 31p. May 1977. SFA 23(3)
[Rome, Italy]

78-002098 Freeman, H. C.; Shum, G.; Uthe, J. F. THE SELENIUM CONTENT IN SWORDFISH (/XIPHIAS GLADIUS/) IN RELATION TO TOTAL MERCURY CONTENT. J. Environ. Sci. Health A Environ. Sci. Eng. 13 (3): 235-240. 1978. SFA 23(3)

78-002099 Geckler, J. R.; Horning, W. B.; Neiheisel, T. M.; Pickering, Q. H.; Robinson, E. L.; Stephan, C. E. VALIDITY OF LABORATORY TESTS FOR PREDICTING COPPER TOXICITY IN STREAMS. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-76-116. xv + 192p. Dec. 1976. SFA 23(3)
[W. B. Horning: Newtown Fish Toxicol. Stn., Cincinnati, OH 45244] A field study was conducted on Shayler Run, in Clermont County, Ohio, to determine the effects of copper on the stream biota. Copper was added to the stream for 33 months to maintain a concentration of 120 ug/l., a concentration that was expected to adversely affect some species of fish and not others. This natural stream received sewage effluent containing a variety of compounds known to affect acute copper toxicity. All but one abundant species of fish in the stream and four

78-002099 CONTINUED
of the five most abundant macroinvertebrates were adversely affected by exposure to copper. Direct effects on fish were death, avoidance, and restricted spawning. To determine the usefulness of laboratory toxicity tests when establishing water quality criteria for an aquatic ecosystem, acute and chronic tests with copper were conducted at the Newtown Fish Toxicology Station and on-site at Shayler Run with stream species and the fathead minnow. The acute toxicity of copper varied widely because of water quality variations in the stream. The chronic tests underestimated the in-stream toxicity by about two times because only the effects of copper on survival, growth, and reproduction were measured but avoidance was not and it was a significant effect in the stream. Agreement between the predictions from laboratory toxicity tests and the observed effect is surprisingly close considering the measurement errors involved.

78-002100 Granett, J.; Morang, S.; Hatch, R. REDUCED MOVEMENT OF PRECOCIOUS MALE ATLANTIC SALMON PARR INTO SUBLETHAL DIMILIN-G1 AND CARRIER CONCENTRATIONS. Bull. Environ. Contam. Toxicol. 19 (4): 462-464. Apr. 1978. SFA 23(3)
[Dep. Entomol., Univ. Me., Orono]

78-002101 Hacking, M. A.; Budd, J.; Hodson, K. THE ULTRASTRUCTURE OF THE LIVER OF THE RAINBOW TROUT: NORMAL STRUCTURE AND MODIFICATIONS AFTER CHRONIC ADMINISTRATION OF A POLYCHLORINATED BIPHENYL AROCLOR 1254. Can. J. Zool. 56 (3): 477-491. Mar. 1978. In English with French summ. SFA 23(3)
[Dep. Pathol., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

78-002102 Hamdy, M. K.; Prabhu, N. V. BEHAVIOR OF MERCURY IN BIO-SYSTEMS. II. DEPURATION OF $^{203}HG^{2}$ IN VARIOUS TROPHIC LEVELS. Bull. Environ. Contam. Toxicol. 19 (3): 365-373. Mar. 1978. SFA 23(3)
[Dep. Food Sci., Univ. Ga., Athens 30602]

78-002103 Hartman, A. M. MERCURY FEEDING SCHEDULES: EFFECTS ON ACCUMULATION, RETENTION, AND BEHAVIOR IN TROUT. Trans. Am. Fish. Soc. 107 (2): 369-375. Mar. 1978. SFA 23(3)
[Dep. Psychol., Idaho State Univ., Pocatello 83201]

78-002104 Hattula, M. L.; Reunanen, H.; Arstila, A. U. THE TOXICITY OF MCPA TO FISH. LIGHT AND ELECTRON MICROSCOPY AND THE CHEMICAL ANALYSIS OF THE TISSUE. Bull. Environ. Contam. Toxicol. 19 (4): 465-470. Apr. 1978. SFA 23(3)
[Dep. Chem., Univ. Jyvaskyla, SF-40100 Jyvaskyla 10, Finland]

78-002105 Hermanutz, R. O. ENDRIN AND MALATHION TOXICITY TO FLAGFISH (/JORDANELLA FLORIDAE/). Arch. Environ. Contam. Toxicol. 7 (2): 159-168. 1978. SFA 23(3)
[U.S. EPA, Environ. Res. Lab., Duluth, MN 55804] Endrin and malathion effects on survival, growth, and reproduction of flagfish were determined in a flow-through system. Endrin chronic effects on first-Generation growth and reproduction occurred only at 0.3 ug/L, the highest concentration tested. The mean endrin residues in the first-generation fish at 65 days were about 15,000 times the water concentration in all concentrations tested. Malathion concentrations of 31.5 ug/L and 24.7 ug/L, the highest concentrations tested, had detrimental effects on first-generation survival. During the same period malathion concentrations as low as 10.9 ug/L significantly

78-002105 CONTINUED
affected growth. Neither insecticide, at the concentrations tested, had any detectable effects on the second generation during a 30-day exposure period. Acute toxicities to juvenile fish were also determined in the same flow-through system. The 96-hr LC50's were 0.85 ug/L for endrin and 349 ug/L for malathion.

78-002106 Hodgson, D. W.; Kantor, E. J.; Mann, J. B. ANALYTICAL METHODOLOGY FOR THE DETERMINATION OF KEPONE RESIDUES IN FISH, SHELLFISH, AND H-VOL AIR FILTERS. Arch. Environ. Contam. Toxicol. 7 (1): 99-112. 1978. SFA 23(3)
[U.S. EPA, Research Triangle Park, NC 27711]

78-002107 Hodson, P. V.; Blunt, B. R.; Spry, D. J. PH-INDUCED CHANGES IN BLOOD LEAD OF LEAD-EXPOSED RAINBOW TROUT (/SALMO GAIRDNERI/). J. Fish. Res. Board Can. 35 (4): 437-445. Apr. 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Canada Cent. Inland Waters, Great Lakes Biolimnol. Lab., Burlinton, ON L7R 4A6, Canada]

78-002108 Jackson, D. A.; Gardner, D. R. /IN VITRO/ EFFECTS OF DDT ANALOGS ON TROUT BRAIN MG^2 -ATPASES. II. INHIBITION KINETICS. Pestic. Biochem. Physiol. 8 (2): 123-128. Apr. 1978. SFA 23(3)
[D. R. Gardner: Dep. Biol., Carleton Univ., Ottawa, ON K1S 5B6, Canada]

78-002109 Jackson, D. a.; Gardner, D. R. /IN VITRO/ EFFECTS OF DDT ANALOGS ON TROUT BRAIN MG^2 -ATPASES. I. SPECIFICITY AND PHYSIOLOGICAL SIGNIFICANCE. Pestic. Biochem. Physiol. 8 (2): 113-122. Apr. 1978. SFA 23(3)
[D. R. Gardner: Dep. Biol., Carlton Univ., Ottawa, ON K1S 5B6, Canada]

78-002110 Jarvinen, A. W.; Hoffman, M. J.; Thorslund, T. W. TOXICITY OF DDT FOOD AND WATER EXPOSURE TO FATHEAD MINNOWS. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-76-114. viii + 68p. Dec. 1976. SFA 23(3)
[U.S. EPA, Environ. Res. Lab., Duluth, MN 55804] Fathead minnows (/Pimephales promelas/) were exposed during a partial chronic toxicity test to two DDT concentrations in the water, one in the diet, and combinations of water and diet for 266 days through a reproductive period of their life cycle. Tissue-residue analyses were performed on test fish at preset intervals throughout the exposure and also on embryos, larvae at hatch, and 30- and 60-day progeny. The contribution of DDT from each source was monitored with gas-chromatography and liquid-scintillation techniques. The diet was clams that had accumulated 14C-DDT when exposed at a DDT water concentration simliar to that in the high fish exposure. Higher total DDT tissue residues were accumulated from the water than from the diet. Residues contributed by dietary DDT were additive to those from the water. Mean concentration factors were 1.2 times from the diet and 100,000 times from the water. Mortality was higher in fish exposed to DDT in both water and diet than in fish exposed to only one or the other of these sources. DDT in the diet significantly reduced the probability of survival of the test fish (P=0.025). Estimated maximum acceptable toxicant concentrations for DDT are 0.9 ug/l for fish exposed to DDT in the water only or 0.4 ug/l for fish exposed to DDT in both water and diet. Embryo DDT residues and larval mortality were about twice as great for embryos and larvae from parent fish that had been exposed to

78-002110 CONTINUED
DDT in both water and diet as for those from parent fish exposed to DDT in the water only. About 60 percent of the mean total micrograms of combined DDT analogs in fish that had been exposed to DDT at 0.5 ug/l in the water and in the diet was eliminated within 56 days. Almost all of the eliminated DDT was dietary DDT. Elimination in fish that had been exposed to DDT in the water only was negligible.

78-002111 Khvoles, A. G.; Korobko, Yu. A. THE EFFECT OF DIMETHYL SULFATE ON THE REPRODUCTIVE SYSTEM OF THE LOACH, /MISGURNUS FOSSILIS/. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 333-336. 1977. SFA 23(3)
[Acad. Med. Sci. USSR, Moscow, USSR]

78-002112 Kimball, G. L.; Smith, L. L., Jr.; Broderius, S. J. CHRONIC TOXICITY OF HYDROGEN CYANIDE TO THE BLUEGILL. Trans. Am. Fish. Soc. 107 (2): 341-345. Mar. 1978. SFA 23(3)
[Dep. Entomol. Fish. Wildl., Univ. Minn., 1980 Folwell Ave., St. Paul 55108]

78-002113 Kwasnik, J. F. S. EFFECTS OF CADMIUM ON THE PREDATOR-PREY BEHAVIOR OF FATHEAD MINNOWS (/PIMEPHALES PROMELAS/) AND LARGEMOUTH BASS (/MICROPTERUS SALMOIDES/) IN A MODEL ECOSYSTEM. Ph.D. dissertation, Purdue Univ. 78p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(10), Apr. 1978. SFA 23(3)
The effects of acute and chronic sublethal cadmium exposure on the predator-prey interactions between largemouth bass (/Micropterus salmoides/) and fathead minnows (/Pimephales promelas/) were investigated. Fathead minnows were exposed to cadmium and subjected to predation in a model ecosystem that was designed to mimic a natural environment. The lowest acute and chronic cadmium concentrations that increased prey vulnerability were 0.375 and 0.025 mg Cd/liter, Respectively, with the latter well below the Maximum Acceptable Toxicant Concentration for fathead minnows. Extensive observations determined that prey exposed to cadmium displayed altered behavioral patterns, including abnormal schooling behavior. Anti-predator devices utilized by fathead minnows include schooling, surface swimming, formation of a circular aggregation, and seeking refuge under vegetation.

78-002114 Lipsky, M. M.; Klaunig, J. E.; Hinton, D. E. COMPARISON OF ACUTE RESPONSE TO POLYCHLORINATED BIPHENYL IN LIVER OF RAT AND CHANNEL CATFISH: A BIOCHEMICAL AND MORPHOLOGICAL STUDY. J. Toxicol. Environ. Health 4 (1): 107-121. Jan. 1978. SFA 23(3)
[Comp. Environ. Pathobiol. Prog., Dep. Pathol., Univ. Md. Sch. Med., Baltimore] The acute response of liver of channel catfish and rat to polychlorinated biphenyl was compared on a structural and functional basis. Both the rat and the fish had elevated microsomal enzyme activities. However, in the rat the response was quantitatively greater in all respects. Morphologically, rats responded with lipid accumulation and marked increases in smooth endoplasmic reticulum. Fish liver showed lipid accumulation and increased profiles of rough endoplasmic reticulum with alterations in arrangement that appeared as vesicles and parallel cisternae. Minimal changes were seen in smooth endoplasmic reticulum, which appeared to be increased as discrete foci.

78-002115 Mancy, K. H.; Allen, H. E. A CONTROLLED BIOASSAY SYSTEM FOR MEASURING TOXICITY OF HEAVY METALS. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-77-037. ix + 111p. Apr. 1977. SFA 23(3)
[Dep. Environ. Ind. Health, Sch. Public Health, Univ. Mich., Ann Arbor 48109]

78-002116 Marshall, J. S. POPULATION DYNAMICS OF /DAPHNIA GALEATA MENDOTAE/ AS MODIFIED BY CHRONIC CADMIUM STRESS. J. Fish. Res. Board Can. 35 (4): 461-469. Apr. 1978. In English with French summ. SFA 23(3)
[Ecol. Sci. Sect., Radiol. Environ. Res. Div., Argonne Natl. Lab., Argonne, IL 60439]

78-002117 Mattson, V. R.; Arthur, J. W.; Walbridge, C. T. ACUTE TOXICITY OF SELECTED ORGANIC COMPOUNDS TO FATHEAD MINNOWS. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-76-097. vi + 13p. Oct. 1976. SFA 23(3)
[U.S. EPA, Environ. Res. Lab., Duluth, MN 55804] Static nonrenewal laboratory Bioassays were conducted with 26 organic compounds commonly used by industry. The selected compounds represented the five following chemical classes: Acids, alcohols, hydrocarbons, ketones and aldehydes, and phenols. Juvenile fathead minnows (/Pimephales promelas/) were the test animal, and test duration was limited to 96 hr. Lake Superior water served as the diluent source for all test compounds. Additional tests were conducted with a reconstituted diluent water for five compounds. The alcohol compounds were generally 10 to 100 times less toxic than chemicals tested in the other four chemical classes. Compounds in the other four classes had a similar toxicity range. The most lethal chemical tested was pentachlorophenol (96-hr LC50 of 0.6 mg/l.) and the least lethal was ethanol (96-hr LC50 of 13,480 mg/l.). Most of the minnow deaths occurred during the first 24 hr. Comparative chemical tests in the two diluent waters gave similar lethal responses.

78-002118 McCain, B. B.; Hodgins, H. O.; Gronlund, W. D.; Hawkes, J. W.; Brown, D. W.; Myers, M. S.; Vandermeulen, J. H. BIOAVAILABILITY OF CRUDE OIL FROM EXPERIMENTALLY OILED SEDIMENTS TO ENGLISH SOLE (/PAROPHRYS VETULUS/), AND PATHOLOGICAL CONSEQUENCES. J. Fish. Res. Board Can. 35 (5): 657-664. May 1978. In English with French summ. SFA 23(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

78-002119 McCain, J. C.; Peck, J. M., Jr. THE TOXICITY OF SELECTED CHEMICALS USED IN POWER GENERATING STATIONS TO HAWAIIAN FISHES. Univ. Hawaii Sea Grant Tech. Rep. UNIHI-SEAGRANT-TR-77-01. v + 17p. Sept. 1976. SFA 23(3)
The acute toxicity of two waterborne chemicals to fishes was investigated. The two compounds, filming amine and morpholine, are used as corrosive inhibitors in the steam and condensate lines of some power generating stations on Oahu. The acute-static 96-hour LC(50) or TL(m) for these compounds was determined for four common Hawaiian marine fishes--the mosquito fish, /Gambusia affinis/; the white mullet, /Chelon engeli/; the damselfish, /Dascyllus albisella/; and a species of /Tilapia/. The 96-hour TL(m) for morpholine was found to be between 100 and 180 ppm for /Chelcn engeli/ and between 320 and 560 ppm for /Gambusia affinis/. The 96-hour LC(50) value for filming amine was found to be 0.41 ppm for adult /Gambusia affinis/ and the 96-hour TL(m) to be 0.25 ppm for juveniles. The range finding results for

78-002119 CONTINUED
/Chelon engeli/, /Dascyllus albisella/, and /Tilapia/ sp. indicated similar toxicity values for the filming amine. The discharges of these compounds do not exceed the maximum permissible values as determined by the LC(50) or TL(m) values after applying a 0.01 factor. The discharge of these compounds at less than 0.0025 ppm for filming amine and 1.00 ppm for morpholine does not constitute a waste as currently defined by state and federal laws and regulations.

78-002120 McKim, J. M.; Eaton, J. G.; Holcombe, G. W. METAL TOXICITY TO EMBRYOS AND LARVAE OF EIGHT SPECIES OF FRESHWATER FISH--II: COPPER. Bull. Environ. Contam. Toxicol. 19 (5): 608-616. May 1978. SFA 23(3)
[US EPA, 6201 Congdon Blvd., Duluth, MN 55804] Fish larvae and early juveniles of all species tested (brook trout, rainbow trout, brown trout, lake trout, northern pike, white sucker, herring, and smallmouth bass) were more sensitive to copper than the embryos. Embryo survival was affected only at the higher concentrations tested, for all species except the rainbow trout. The concentrations of copper that caused significant effects on the larval standing crop were similar for all species (31.7-43.5 ug Cu/l) except the northern pike, which seemed to be considerably more resistant (104.1 ug Cu/l). Copper concentrations shown to have no significant effects on the early developmental stages of these species are considered close estimates of the copper concentrations that would have no measurable adverse effects during a complete life cycle toxicity test under similar test conditions.

78-002121 Melancon, M. J., Jr.; Lech, J. J. DISTRIBUTION AND ELIMINATION OF NAPHTHALENE AND 2-METHYLNAPHTHALENE IN RAINBOW TROUT DURING SHORT- AND LONG-TERM EXPOSURES. Arch. Environ. Contam. Toxicol. 7(2) 207-220. 1978. SFA 23(3)
[Dep. Pharmacol., Med. Coll. Wis., 561 North 15 St., Milwaukee 53233]

78-002122 Mitchell, A. J.; Grizzle, J. M.; Plumb, J. A. NIFURPIRINOL (FURANACE; P-7138) RELATED LESIONS ON CHANNEL CATFISH /ICTALURUS PUNCTATUS/ (RAFINESQUE). J. Fish Dis. 1 (1): 115-121. Jan. 1978. SFA 23(3)
[U.S. FWS, Fish Farm. Exp. Stn., P.O. Box 860, Stuttgart, AR 72160] Skin lesions developed on channel catfish, /Ictalurus punctatus/, exposed to 0.5 mg/l Furanace for 4 or 14 days. Lesions developed 3 days after the 4-day exposure and on the eleventh day of the 14-day exposure. the lesions continued to develop after the fish were moved to untreated water. The lesions which began as dull areas of skin, sometimes resulted in erosion of skin and muscle which exposed the vertebrae. Bacteria were not isolated from the lesions except those with severely eroded muscle. The gills possessed lesions characteristic of a response to a toxic chemical agent.

78-002123 Muirhead-Thomson, R. C. LETHAL AND BEHAVIORAL IMPACT OF CHLORPYRIFOS METHYL AND TEMEPHOS AND SELECT STREAM MACROINVERTEBRARTES: EXPERIMENTAL STUDIES ON DOWNSTREAM DRIFT. Arch. Environ. Contam. Toxicol. 7 (2): 139-147. 1978. SFA 23(3)
[Jealotts Hill Res. Stn., Bracknell, Berkshire, England]

78-002124 Muirhead-Thomson, R. C. RELATIVE SUSCEPTIBILITY OF STREAM MACROINVERTEBRATES TO TEMEPHOS AND CHLORPYRIFOS, DETERMINED IN LABORATORY CONTINUOUS-FLOW SYSTEMS. Arch. Environ. Contam. Toxicol. 7 (2): 129-137. 1978. SFA 23(3)
[Jealotts Hill Res. Stn., Bracknell, Berkshire, England]

78-002125 Nevins, M. J.; Johnson, W. W. ACUTE TOXICITY OF PHOSPHATE ESTER MIXTURES TO INVERTEBRATES AND FISH. Bull. Environ. Contam. Toxicol. 19 (2): 250-256. Feb. 1978. SFA 23(3)
[U.S. FWS, Fish-Pestic. Res. Lab., Columbia, MO 65201] The acute toxicity of three commercial phosphate ester mixtures (hydraulic fluids) was tested against two invertebrates and four fishes. Pydraul 50E was more toxic than Houghtosafe 1120 in static and flow-through tests; Pydraul 115E was the least toxic. In flow-through tests these phosphate esters were less acutely toxic than PCB's. However, sublethal reactions to the phosphates suggest a need for chronic toxicity studies.

78-002126 Nilov, V. I.; Fedoseyenko, V. M.; Shekhanova, I. A. EYE DAMAGE TO THE GRASS CARP (/CTENOPHARYNGODON IDELLA/) FROM CHRONIC UPTAKE OF STRONTIUM 90. J. Ichthyol. (Engl. Trans. Vopr. Ikhtiol.) 16 (6): 1001-1006. 1976. SFA 23(3)
[Inst. Zool., Kazakh Acad. Sci., Alma-ata, USSR] An investigation was made of the distribution of strontium 90 in the eye tissues of the grass carp (/Ctenopharyngodon idella/) from the chronic uptake of this radionuclide. It was found that the nature of the distribution of strontium 90 in the eye tissues was not identical, and also that the chronic uptake of the radionuclide by grass carp fingerlings over a period of 2 months led to pathological changes in the eye tissues.

78-002127 Olson, K. R.; Squibb, K. S.; Cousins, R. J. TISSUE UPTAKE, SUBCELLULAR DISTRIBUTION, AND METABOLISM OF ^{14}CH(3)HGCL AND CH(3)^{203}HGCL BY RAINBOW TROUT, /SALMO GAIRDNERI/. J. Fish. Res. Board Can. 35 (4): 381-390. Apr. 1978. In English with French summ. SFA 23(3)
[Indiana Univ., Sch. Med., South Bend Cent., Haggar Hall, Univ. Notre Dame, Notre Dame, IN 46556]

78-002128 Oswald, R. L. INJECTION ANAESTHESIA FOR EXPERIMENTAL STUDIES IN FISH. Comp. Biochem. Physiol. C Comp. Pharmacol. 60 (1): 19-26. 1978. SFA 23(3)
[Dep. Biol., Univ. Stirling, Scotland] Eight anaesthetic drugs were tested by intramuscular or intraperitoneal injection in trout. The alphaxalone/alphadolone acetate mixture (Saffan) produced superior long-duration anaesthesia though assisted ventilation was sometimes required. Propanidid (Epontol) was considered to be the best short-acting agent tested. The neuroleptanalgesic combination of etorphine HCT/acetylpromazine maleate (Immobilon) gave, quantitatively, the best anaesthesia of all the drugs tested and was immediately reversible by injecting the antagonist diprenorphine HCl (Revivon). Spinal anaesthesia with lignocaine HCl (Xylocaine) was found to be another effective means of immobilizing fish.

78-002129 Patrick, R. EFFECTS OF TRACE METALS IN THE AQUATIC ECOSYSTEM. Am. Sci. 66 (2): 185-191. Mar.-Apr. 1978. SFA 23(3)
[Acad. Nat. Sci., Philadelphia, PA 19103]

78-002130 Payne, J. F.; Kiceniuk, J. W.; Squires, W. R.; Fletcher, G. L. PATHOLOGICAL CHANGES IN A MARINE FISH AFTER A 6-MONTH EXPOSURE TO PETROLEUM. J. Fish. Res. Board Can. 35 (5): 665-667. May 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Newfoundland Biol. Stn., St. John's, NF A1C 1A1, Canada]

78-002131 Pentreath, R. J. THE ACCUMULATION OF CADMIUM BY THE PLAICE, /PLEURONECTES PLATESSA/ L. AND THE THORNBACK RAY, /RAJA CLAVATA/ L. J. Exp. Mar. Biol. Ecol. 30 (3): 223-232. Dec. 1977. SFA 23(3)
[Minist. Agric. Fish. Food, Fish. Radiobiol. Lab., Lowestoft, Suffolk, England] The accumulation of cadmium (^{115}Cd) from both food and sea water by the plaice, /Pleuronectes platessa/ L., and thornback ray, /Raja clavata/ L., has been studied in relation to their measured cadmium concentrations. Plaice accumulated cadmium from sea water at a faster rate than rays, although the concentration factors attained by both species as a result of such direct accumulation were very low. Both species retained cadmium from food and accumulated it in the liver, the rays relatively more than the plaice. From analyses of North Sea fish, some evidence was found for a positive linear relation between the concentration of cadmium in plaice liver and age, but not weight, of the fish.

78-002132 Percy, J. A. EFFECTS OF CHRONIC EXPOSURE TO PETROLEUM UPON THE GROWTH AND MOLTING OF JUVENILES OF THE ARCTIC MARINE ISOPOD CRUSTACEAN /MESIDOTEA ENTOMON/. J. Fish. Res. Board Can. 35 (5): 650-656. May 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Arctic Biol. Stn., Ste. Anne de Bellevue, QU H9X 3L6, Canada]

78-002133 Price, N. R. DISRUPTION OF EXCITATION-CONTRACTION COUPLING BY ORGANIC INSECTICIDES. MODE OF ACTION IN THE MUSCLE OF THE FLOUNDER, /PLATICHTHYS FLESUS/. Comp. Biochem. Physiol. C Comp. Pharmacol. 59 (2): 127-133. 1978. SFA 23(3)
[Pest Infect. Control Lab., Slough, Bucks. England]

78-002134 Ray, S. BIOACCUMULATION OF LEAD IN ATLANTIC SALMON (/SALMO SALAR/). Bull. Environ. Contam. Toxicol. 19 (5): 631-636. May 1978. SFA 23(3)
[Fish. Mar. Serv., Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

78-002135 Poseboom, D. P.; Richey, D. L. ACUTE TOXICITY OF RESIDUAL CHLORINE AND AMMONIA TO SOME NATIVE ILLINOIS FISHES. Ill. State Water Surv. Rep. Invest. 85. 42p. 1977. SFA 23(3)
[Ill. State Water Surv. Div., Urbana] Ninety-six hour residual chlorine bioassays were conducted on bluegill and channel catfish. In 96-hr acute toxicity studies with ammonia (NH_3-N) bass, in addition to bluegill and channel catfish, were included. The studies were performed in waters typical of most lakes and streams in midwestern states, i.e., relatively high in alkalinity and the salts of calcium and magnesium. Observations regarding the characteristics and reaction

78-002135 CONTINUED
of the fishes to each toxicant were noted. For residual chlorine the 96-hour TL(50)s ranged from 0.18 to 0.33 mg/l for bluegill, depending on temperature and fish weight. For channel catfish the TL(50) was about 0.09 mg/l; temperature was not a factor. For ammonia the 96-hour TL(50)s for bluegill were dependent on temperature and fish weight and varied from 0.40 to 1.3 mg/l. Size was not a factor for bass and channel catfish. Ninety-six hour TL(50)s for these fishes ranged from 0.72 mg/l at 22° to 1.2 mg/l at 30° C for bass and 1.5 mg/l at 22°C to 3.0 mg/l at 28°C for channel catfish. For protection of the fishes investigated, and consistent with the water pollution regulations of Illinois, residual chlorine in Illinois waters should not be detectable and NH(3)-N should not exceed a concentration of 0.04 mg/l.

78-002136 Roseboom, D. P.; Richey, D. L. ACUTE TOXICITY OF RESIDUAL CHLORINE ON BLUEGILL AND CHANNEL CATFISH IN ILLINOIS. Trans. Ill. State Acad. Sci. 69 (4): 385-398. Sept. 1977. SFA 23(3)
[Ill. State Water Surv., Water Qual. Sect., Box 717, Peoria 61601]
Ninety-six hour residual chlorine bioassays were conducted on bluegill and channel catfish with a modified Mount and Brungs proportional dilutor. The 96-hour TL(50)s for bluegill and catfish were 0.33 and 0.09 mg/l, respectively, and the environmental effects of water temperature and fish weight were quantified through linear regression analyses. The product of the 96-hour TL(50) and the 0.1 Illinois safety factor places the allowable residual chlorine at the limit of detection for the amperometric titrator and essentially means no detectable residual chlorine is allowed in Illinois waters.

78-002137 Roubal, W. T.; Stranahan, S. I.; Malins, D. C. THE ACCUMULATION OF LOW MOLECULAR WEIGHT AROMATIC HYDROCARBONS OF CRUDE OIL BY COHO SALMON (/ONCORHYNCHUS KISUTCH/) AND STARRY FLOUNDER (/PLATICHTHYS STELLATUS/). Arch. Environ. Contam. Toxicol. 7 (2): 237-244. 1978. SFA 23(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

78-002138 Sastry, K. V.; Gupta, P. K. ALTERATIONS IN THE ACTIVITY OF SOME DIGESTIVE ENZYMES OF /CHANNA PUNCTATUS/, EXPOSED TO LEAD NITRATE. Bull. Environ. Contam. Toxicol. 19 (5): 549-555. May 1978. SFA 23(3)
[Dep. Zool., D.A.V. (P.G.) Coll., Muzaffarnagar (U.P.), India]

78-002139 Schultz, T. W.; Davis, S.; Dumont, J. N. TOXICITY OF COAL-CONVERSION GASIFIER CONDENSATE TO THE FATHEAD MINNOW. Bull. Environ. Contam. Toxicol. 19 (2): 237-243. Feb. 1978. SFA 23(3)
[Univ. Tenn., Oak Ridge Grad. Sch. Biomed. Sci., Oak Ridge 37830]

78-002140 Seegert, G. L.; Brooks, A. S. THE EFFECTS OF INTERMITTENT CHLORINATION ON COHO SALMON, ALEWIFE, SPOTTAIL SHINER, AND RAINBOW SMELT. Trans. Am. Fish. Soc. 107 (2): 346-353. Mar. 1978. SFA 23(3)
[Dep. Zool., Univ. Wis., Milwaukee 53201]

78-002141 Spehar, R. L. CADMIUM AND ZINC TOXICITY TO /JORDANELLA FLORIDAE/. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-76-096. vi + 34p. Nov. 1976. SFA 23(3)
[U.S. EPA, Environ. Res. Lab., Duluth, MN 55804] Cadmium and zinc toxicity to the flagfish (/Jordanella floridae/) was determined on the basis of 96-hr median lethal concentrations (LC50) and significant decreases (P = 0.05) in survival, growth, and reproduction over the complete life cycle of the fish. The 96-hr LC50 values for cadmium and zinc to juvenile flagfish were 2,500 and 1,500 ug/liter, respectively. In chronic tests, Reproduction was the most sensitive indicator of cadmium toxicity and was inhibited at 8.1 ug/liter. Tissue-concentration analysis showed that fish exposed to concentrations of 1.7 ug/liter and above accumulated significantly greater amounts of cadmium than those in the controls. In zinc tests, survival of larvae (not exposed as embryos) and growth of females were the most sensitive measure of zinc toxicity and were reduced at respective concentrations of 85 and 51 ug/liter. Significant uptake of zinc occurred in fish exposed to concentrations of 47 ug/liter and above. The lowest cadmium and zinc concentrations causing adverse effects to the flagfish were similar to those affecting other fish species. Application factors for both metals were similar to those reported for cadmium exposed bluegills (/Lepomis macrochirus/) and zinc exposed fathead minnows (/Pimephales promelas/) in hard water.

78-002142 Spehar, R. L.; Leonard, E. N.; DeFoe, D. L. CHRONIC EFFECTS OF CADMIUM AND ZINC MIXTURES ON FLAGFISH (/JORDANELLA FLORIDAE/). Trans. Am. Fish. Soc. 107 (2): 354-360. Mar. 1978. SFA 23(3)
[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804]

78-002143 Stainken, D. M. EFFECTS OF UPTAKE AND DISCHARGE OF PETROLEUM HYDROCARBONS ON THE RESPIRATION OF THE SOFT-SHELL CLAM, /MYA ARENARIA/. J. Fish. Res. Board Can. 35 (5): 637-642. May 1978. In English with French summ. SFA 23(3)
[U.S. EPA, Ind. Environ. Res. Lab., Edison, NJ 08817]

78-002144 Statham, C. N.; Elcombe, C. R.; Szyjka, S. P.; Lech, J. J. EFFECT OF POLYCYCLIC AROMATIC HYDROCARBONS ON HEPATIC MICROSOMAL ENZYMES AND DISPOSITION OF METHYL-NAPHTHALENE IN RAINBOW TROUT /IN VIVO/. Xenobiotica 8 (2): 65-71. Feb. 1978. SFA 23(3)
[Dep. Pharmacol., Med. Coll. Wis., Milwaukee 53233] The effects of 3-methylcholanthrene, 2,3-benzanthracene and beta-naphthoflavone on xenobiotic metabolism in rainbow trout were studied. These three polycyclic aromatic hydrocarbons increase hepatic arylhydrocarbon (benzo[/a/]pyrene) hydroxylase activity without altering glucuronyl transferase activity. All three polycyclic aromatic hydrocarbons increased hepatic microsomal cytochrome P-450 levels by approximately 50 percent. Pretreatment of trout with 2,3-benzanthracene resulted in an increase in the metabolism and biliary excretion of 2-methylnaphthalene /in vivo/. These studies demonstrate that the induction of mono-oxygenation by polycyclic aromatic hydrocarbons can result in significant effects upon the metabolism and excretion of xenobiotics by fish /in vivo/.

78-002145 Stegeman, J. J. INFLUENCE OF ENVIRONMENTAL CONTAMINATION ON CYTOCHROME P-450 MIXED-FUNCTION OXYGENASES IN FISH: IMPLICATIONS FOR RECOVERY IN THE WILD HARBOR MARSH. J. Fish. Res. Board Can. 35 (5): 668-674. May 1978. In English with French summ. SFA 23(3)
[Dep. Biol., Woods Hole Oceanogr. Inst., Woods Hole, MA 02543]

78-002146 Stevens, D. G. SURVIVAL AND IMMUNE RESPONSE OF COHO SALMON EXPOSED TO COPPER. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-77-031. x + 37p. Mar. 1977. SFA 23(3)
[West. Fish Toxicol. Stn., Corvallis, OR 97330] Vaccination with /Vibrio anguillarum/ by oral administration during copper exposure and intraperitoneal injection prior to copper exposure was employed to investigate the effects of copper upon survival and the immune response of juvenile coho salmon (/Oncorhynchus kisutch/). Following copper exposure the survivors were challenged under natural conditions to /V. anguillarum/, the causative agent of vibriosis in fish. Copper concentrations of 18.1 ug/liter and higher caused significant mortality among coho fry during 30 days of exposure. The exposure of copper bioassay survivors to a natural challenge against /V. anguillarum/ in seawater caused significant mortality among those fish from concentrations of copper at 13.9 ug/liter and higher. The reduced number of dead fish positive for /V. anguillarum/ from the challenge suggests that sublethal copper stress and difficulty with seawater adaptation may have caused several deaths. Significant mortality occurred among coho fingerlings exposed to 24.6 ug/liter copper and higher for 31 days. Most of the survivors of these concentrations were unable to adapt to seawater and died within the first three days of challenge. Significant mortality also occurred during adaptation of survivors from 18.2 ug/liter copper where the mean mortality resulting from 31 days exposure was only 2 percent. The antibody level against /V. anguillarum/, measured by agglutinin titer, was significantly reduced in fish exposed to this concentration of copper when compared to that developed in control animals.

78-002147 Strand, J. A.; Fujihara, M. P.; Poston, T. M. PERMANENCE OF SUPPRESSION OF THE PRIMARY IMMUNE RESPONSE IN RAINBOW TROUT SUBLETHALLY EXPOSED TO TRITIUM DURING EMBRYOGENESIS. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 323. July 1977. Abstract only. SFA 23(3)
[Battelle Pac. Northwest Lab., Richland, WA] Previous experiments demonstrated that antibody synthesis in response to challenge from the bacterium, /Flexibacter columnaris/, was significantly suppressed in juvenile (5 month) rainbow trout (/Salmo gairdneri/) following exposure to tritium at doses as low as 4 rads when administered during the first 20 days of embryogenesis. In continuing studies, a secondary challenge to viable columnaris cells delivered to yearling (17 month) trout was used to test the hypothesis that early embryonic exposure to tritium in permanent and irreparable i in permanent and irreparable injury to the immune process. Test fish employed in the most recent test series were maintained an additional 12 months on dechlorinated sanitary water after receiving primary antigenic challenge. When 17 months old, control and tritium irradiated fish were again administered intraperitoneally 0.1 cc of a heat inactivated antigen (1.8×10^8 cells/ml /F. columnaris/) in 25 percent Freund's incomplete antigen. At 3 weeks and 1 week pre-secondary challenge and 2, 4, 7 and 10 weeks post-secondary challenge, a standard tube agglutination test for the specific antigen of antibody stimulation was performed on the serum of 20 fish from each of the control and irradiated test groups. Results indicated that under the prescribed experimental conditions, a clearly observable and statistically significant change in mean titer

78-002147 CONTINUED
values occurred over 10 weeks following secondary challenge. As well, significant differences were detected in mean titer values between control and 0.4 rad test groups and higher, thus indicating persistence of injury to the immune processes.

78-002148 Sullivan, J. F.; Atchison, G. J.; Kolar, D. J.; McIntosh, A. W. CHANGES IN THE PREDATOR-PREY BEHAVIOR OF FATHEAD MINNOWS (/PIMEPHALES PROMELAS/) AND LARGEMOUTH BASS (/MICROPTERUS SALMOIDES/) CAUSED BY CADMIUM. J. Fish. Res. Board Can. 35 (4): 446-451. Apr. 1978. In English with French summ. SFA 23(3)
[EG&G Idaho, Inc., P.O. Box 1625, Idaho Falls 83401]

78-002149 Svanberg, O.; Bengtsson, B.-E.; Linden, E.; Lunde, G.; Ofsted, E. B. CHLORINATED PARAFFINS--A CASE OF ACCUMULATION AND TOXICITY TO FISH. Ambio 7 (2): 64-65. 1978. SFA 23(3)
[Natl. Environ.-Prot. Board, Brackish Water Toxicol. Lab., Studsvik, S-61101 Nykoping, Sweden] Chlorinated paraffins have replaced PCB in many industrial processes and in other connections as well. Today their use is both widespread and increasing. The behavior and effects of this group of compounds are difficult to study because the specific analytical methods which have been available lack the necessary sensitivity. Consequently, there are very few data existing which correlate biological effects to residual levels. Neutron activation analysis of chlorine provides a method for the indirect measurement of chlorinated organic substances which are fat-soluble and persistant. This method has been used to follow the uptake by fish of chlorinated paraffins in water. The results presented in this report indicate that chlorinated paraffins accumulate in fish experimentally exposed. Symptoms of neurotoxic effects were noted during the exposure. We consider the findings to be alarming. Further studies are needed to verify the effects observed, and to better explore the accumulation of chlorinated paraffins.

78-002150 Thurston, R. V.; Russo, R. C.; Smith, C. E. ACUTE TOXICITY OF AMMONIA AND NITRITE TO CUTTHROAT TROUT FRY. Trans. Am. Fish. Soc. 107 (2): 361-368. Mar. 1978. SFA 23(3)
[Fish. Bioassay Lab., Mont. State Univ., Bozeman 59717]

78-002151 Tomasso, J. R., Jr.; Murphy, G. G. THE EFFECTS OF ALDRIN AND HEPTACHLOR ON FIN REGENERATION IN THE PUGNOSE MINNOW, /NOTROPIS ANOGENUS/. J. Tenn. Acad. Sci. 53 (2): 73. Apr. 1978. Abstract only. SFA 23(3)
[Dep. Biol., Middle Tenn. State Univ., Murfreesboro] The effects of the organochlorine pesticides aldrin and heptachlor on caudal fin regeneration in the pugnose minnow, /Notropis anogenus/, were studied. Twenty-four hour L.C. 50's were determined for each pesticide and the effects of fractional concentrations of these values on regeneration evaluated. Fish were allowed to regenerate in the different concentrations for 14 days. Regeneration was measured on days 7 and 14. Neither pesticide at any concentration significantly retarded regeneration by day 7. By day 14 aldrin in concentrations as low as 8.4 ppb (1/10 of L.C. 50) and heptachlor as low as 11.0 ppb (1/20 of L. C. 50) significantly retarded regeneration. The effects of aldrin and heptachlor concentrations equivalent to 1/10 of their respective 24 hour L.C. 50 values were not significantly different. However, effects of aldrin and heptachlor concentrations equivalent to 1/20 of their respective 24 hour L.C. 50 values were significantly different.

78-002152 Tubb, R. A. , (ed.) RECENT ADVANCES IN FISH TOXICOLOGY. A SYMPOSIUM. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-77-085. v + 204p. July 1975. SFA 23(3)
[Dep. Fish. Wildl., Oreg. State Univ., Corvallis 97331] A collection of 11 papers.--rs

78-002153 Tucker, C. S.; Boyd, C. E. CONSEQUENCES OF PERIODIC APPLICATIONS OF COPPER SULFATE AND SIMAZINE FOR PHYTOPLANKTON CONTROL IN CATFISH PONDS. Trans. Am. Fish. Soc. 107 (2): 316-320. Mar. 1978. SFA 23(3)
[Dep. Fish. Allied Aquacult., Auburn Univ. Agric. Exp. Stn., Auburn, AL 36830]

78-002154 Ultsch, G. R. OXYGEN CONSUMPTION AS A FUNCTION OF PH IN THREE SPECIES OF FRESHWATER FISHES. Copeia 1978 (2): 272-279. 5 May 1978. SFA 23(3)
[Dep. Biol., Univ. Ala., University 35486] The routine rate of oxygen consumption (V(O(2))) was measured over an H(2)SO(4) pH range of 3.5 to 7.0 for three species of freshwater fishes previously exposed for at least two weeks to pH 7.5 or 5.0. V(O(2)) was also measured at pH's from 4.0 to 7.0, in increments of 0.5 pH units, for each species after maintenance at the measurement pH. Preliminary tests showed that acute exposure to pH 3.5 (H(2)SO(4)) was lethal to all three species, and that only /Lepomis macrochirus/ could survive exposure to 4.0 for at least two weeks. V(O(2)) did not show any significant decrease at pH's below 5.0 in /Lepomis macrochirus/ or /Carrasius auratus/, but was significantly depressed in /Ictalurus punctatus/ at pH 3.5. These results suggest that the importance of anoxia as a factor contributing to the death of fishes at low pH may vary among species.

78-002155 Vandermeulen, J. H.; Penrose, W. R. ABSENCE OF ARYL HYDROCARBON HYDROXYLASE (AHH) IN THREE MARINE BIVALVES. J. Fish. Res. Board Can. 35 (5): 643-647. May 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Bedford Inst. Oceanogr., Dartsmouth, NS B2Y 4A2, Canada]

78-002156 Waiwood, K. G. EFFECTS OF COPPER, HARDNESS AND PH ON SWIMMING PERFORMANCE AND GROWTH OF RAINBOW TROUT (/SALMO GAIRDNERI/). Ph.D. dissertation, Univ. Guelph (Canada) 1977. From Diss. Abstr. Int. B Sci. Eng. 38(4):1608. Oct. 1977. SFA 23(3)
Mortality, Critical swimming performance, growth rate, appetite and hematocrit of 6 to 14 g /Salmo gairdneri/ were determined at 12 C in the presence of various combinations of copper sulphate, pH, hardness and exposure time. Oxygen consumption in relation to swimming speed was determined in 100 mg l^{-1} hardness for four copper/pH treatments. Hematocrit, red blood cell count, body and muscle moisture, and serum sodium were measured in trout treated for 48 h to a sublethal concentration of copper. When copper was absent, hardness, pH and exposure time had no demonstrable effect on any physiological response measured. These variables did, however, greatly modify the physiological response of trout to copper. The 240 h LC20 for copper ranged from 22 to 300 ug l^{-1}. Copper was most toxic in low pH, low hardness water and least toxic in high pH, high hardness water. Copper had the greatest effect on swimming performance at 5 d of exposure. In high pH, recovery was completed after 10 d of exposure but critical performance did not return to control levels in low pH treatments. At a given copper concentration critical speed decreased to a greater

78-002156 CONTINUED
degree at low than at high hardness. In the presence of copper, growth rate decreased by as much as 200 percent. Generally pH and hardness influenced the growth response to copper in a manner similar to that of critical performance. Recovery in growth rate occurred in some cases. For a given swimming speed, oxygen consumption was higher in the presence of copper. Copper also decreased maximum oxygen consumption. Copper-treated trout exhibited elevated hematocrit under certain conditions of hardness and pH. There was no significant difference between total, soluble and extractable copper but the predicted concentrations of 6 forms varied with pH and hardness. Of these only Cu^{++} and $CuOH^{+}$ were found to be related significantly to critical swimming performance and growth rate.--From abstr.

78-002157 Ward, R. W.; Giffin, R. D.; DeGraeve, G. M.; Stone, R. A. DISINFECTION EFFICIENCY AND RESIDUAL TOXICITY OF SEVERAL WASTEWATER DISINFECTANTS. I. GRANDVILLE, MICHIGAN. U.S. Environ. Prot. Agency Environ. Prot. Technol. Ser. EPA-600/2-76-156. xi + 132p. Oct. 1976. SFA 23(3)
[Dep. Biol., Grand Valley State Coll., Allendale, MI 49401] This study was conducted to determine the comparative effectiveness of chlorine, bromine chloride, and ozone as wastewater disinfectants, and to determine any residual toxicity associated with wastewater disinfection with these agents or with chlorinated wastewater which had been dechlorinated with sulfur dioxide. Streams of nondisinfected and chlorinated wastewater were pumped from the Grandville, Michigan Wastewater Treatment Plant to the project laboratory. Part of the chlorinated wastewater stream was delivered directly to the toxicity laboratory for bioassay studies while the remainder of the chlorinated stream was dechlorinated with sulfur dioxide prior to its use in bioassay tests. A portion of the nondisinfected wastewater stream was delivered to the toxicity laboratory for use in bioassays while the remaining portion was split to receive bromine chloride and ozone prior to use in the bioassay studies. Total and fecal coliform densities, suspended solids, volatile solids, COD, ammonia nitrogen, phosphate, turbidity, color, and pH were measured in the wastewater streams. Each of the five wastewater streams was used in acute toxicity tests with several species of fishes and the freshwater macroinvertebrate /Daphnia magna/, and in a life cycle toxicity study with the fathead minnow, /Pimephales promelas/, as the test subject. Disinfection standards were met most frequently by chlorinated and dechlorinated effluents and less frequently by chlorobrominated effluent. The only time disinfection standards were met consistently by ozonated effluent was when filtration preceded ozone injection. Chlorine was found to be most toxic to aquatic life while sulfur dioxide dechlorination completely eliminated the toxicological effects of chlorine. Bromine chloride was less toxic than chlorine. Ozone was found to be neither acutely nor chronically toxic to the aquatic animals tested.

78-002158 Wedemeyer, G. A.; Yasutake, W. T. PREVENTION AND TREATMENT OF NITRITE TOXICITY IN JUVENILE STEELHEAD TROUT (/SALMO GAIRDNERI/). J. Fish. Res. Board Can. 35 (6): 822-827. June 1978. In English with French summ. SFA 23(3)
[Natl. Fish. Res. Cent., Bldg. 204, Naval Support Activity, Seattle, WA 98115]

78-002159 Werner, A. E.; Robinson, J. ACUTE EFFECTS OF WOOD-PULP ON SOCKEYE SALMON (/ONCORHYNCHUS NERKA/). Water Air Soil Pollut. 9 (1): 69-81. Jan. 1978. SFA 23(3)
[Fish. Mar. Serv., Pac. Environ. Inst., 4160 Marine Dr., West Vancouver, BC, Canada] Freshwater suspensions of pulp fiber in concentrations exceeding 1000 ppm at 15°C are acutely lethal to sockeye salmon fingerlings. Limited adaptation of such fish to fiber is possible but injury, at least in the short term, is irreversible. The acute lethality of various toxicants associated with industrial pulps is synergistically enhanced by the presence of fiber, and pulp storage up to 158 days at 15°C had no significant effect on the acute lethality. Highly purified fibers are less toxic in fresh than in sea water. The sensitivity to fiber of fish from two sources did not differ significantly.

78-002160 Whitmore, D. H., Jr.; Hodges, D. H., Jr. /IN VITRO/ PESTICIDE INHIBITION OF MUSCLE ESTERASES OF THE MOSQUITOFISH, /GAMBUSIA AFFINIS/. Comp. Biochem. Physiol. C Comp. Pharmacol. 59 (2): 145-149. 1978. SFA 23(3)
[Biol. Dep., Univ. Tex., Arlington 76019]

78-002161 Wong, P. T. S.; Chau, Y. K.; Luxon, P. L. TOXICITY OF A MIXTURE OF METALS ON FRESHWATER ALGAE. J. Fish. Res. Board Can. 35 (4): 479-481. Apr. 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Canada Cent. Inland Waters, Burlington, ON L7R 4A6, Canada]

78-002162 Zambriborshch, F. S.; Buy Lay EFFECT OF HEXACHLORANE (HCCH) ON SOME HEMATOLOGICAL AND BIOCHEMICAL CHARACTERISITCS OF THE BLOOD OF THE ROUND GOBY (/GOBIUS MELANOSTOMUS/). J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 507-510. 1977. SFA 23(3)
[Odessa Univ., USSR] At concentrations around the maximum permissible (0.012-0.024 mg/liter) hexachlorane initially increases, but subsequently decreases the number of erythrocytes and leukocytes and the amount of hemoglobin. These indicators are not restored after the fish have spent 3 days in pure water. The amount of blood sugar declines in fish poisoned with hexachlorane and does not return to normal in pure water over a period of 3 days. Hexachlorane disrupts peroxidase activity, which is not restored in pure water. Peroxidase activity is the characteristic that is most sensitive to the effect of hexachlorane.--Concl.

FISH TOXICANTS

78-002163 Mayer, F. L.; Mehrle, P. M.; Crutcher, P. L. INTERACTIONS OF TOXAPHENE AND VITAMIN C IN CHANNEL CATFISH. Trans. Am. Fish. Soc. 107 (2): 326-333. Mar. 1978. SFA 23(3)
[U.S. FWS, Columbia Natl. Fish. Res. Lab., Columbia, MO 65201]

78-002164 Shirgur, G. A. INDICATION OF SAFE POISON MATERIALS FROM INDIGENOUS PLANTS FOR CLEARING UNWANTED FISHES FROM NURSERY PONDS. Indian J. Fish. 22 (1,2): 126-132. 1975. SFA 23(3)
[Taraporevala Mar. Biol. Res. Stn., Bombay, India] Eleven powders made out of different parts of 5 species of indigenous plants have been tested for their piscicidal effect on the common carp (/Cyprinus carpio communis/) fingerlings. LD100 values of these powders were determined after preliminary testing of various properties, such as comparative toxicity, comparative effect of stupor-inducement and comparative effect of biodegradability. It was noted that the powders from the roots of /Balanites roxburghii/ Planch, seeds of /Randia dumentorum/ Lam., twigs and roots of /Derris elliptica (Roxb.) Benth., and bark of /Albizzia lebbeck/ (Linn.) Benth. were dependable substitutes for imported "Derris" powder, giving LD100 values of 3, 3, 7, 8 and 12.6 p.p.m., respectively.

78-002165 Stalling, D. L.; Huckins, J. N. ANALYSIS AND GC-MS CHARACTERIZATION OF TOXAPHENE IN FISH AND WATER. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-76-076. ix + 43p. Aug. 1976. SFA 23(3)
[U.S. FWS, Fish-Pestic. Res. Lab., Columbia, MO 65201] Sensitive methods for the detection and identification of toxaphene in water and fish were described. Polyurethane foam, gel permeation and silicic acid chromatography were utilized to permit accurate quantitation of multi-component toxaphene residues. A method for characterization of changes in isomer composition of toxaphene residues in fish was reported. The chemical composition of toxaphene was examined by electron impact and chemical ionization mass spectrometry. Chemical ionization gas chromatography-mass spectrometry was particularly applicable to the analysis and confirmation of toxaphene residues in environmental samples.

RESEARCH AND MANAGEMENT-GENERAL

78-002166 Gulland, J. A. FISHERY MANAGEMENT: NEW STRATEGIES FOR NEW CONDITIONS. Trans. Am. Fish. Soc. 107 (1): 1-11. Jan. 1978. SFA 23(3)
[Fish. Res. Environ. Div., FAO of the UN, Rome-00100, Italy]

78-002167 Johnson, J. E. REALISTIC MANAGEMENT OF ENDANGERED SPECIES: PROGRESS TO DATE. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 298-301. July 1977. SFA 23(3)
[U.S. FWS, Washington, DC 20240]

78-002168 Lewis, W. M.; Heidinger, R. C.; Anderson, R. O. SPECIAL SESSION: GRASS CARP IN THE UNITED STATES. SUMMARY AND EVALUATION. Trans. Am. Fish. Soc. 107 (1): 223-224. Jan. 1978. SFA 23(3)
[Fish. Res. Lab., South. Ill. Univ., Carbondale 62901]

78-002169 Pehrson, R. V. IDAHO FISH AND WILDLIFE MITIGATION -- COMPLICATIONS AND CONSEQUENCES. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 263-266. July 1977. SFA 23(3)
[Idaho Dep. Fish Game, Boise]

78-002170 Schreiner, K. M. FEDERAL VIEW OF "REALISTIC" ENDANGERED SPECIES ADMINISTRATION AND MANAGEMENT. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 291-297. July 1977. SFA 23(3)
[U.S. FWS, Washington, DC 20240]

78-002171 Sersland, H. N. FISH AND WILDLIFE MITIGATION ON U. S. BUREAU OF RECLAMATION PROJECTS UPPER COLORADO REGION--PAST AND FUTURE. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 257-262. July 1977. SFA 23(3)
[U.S. Bur. Reclam., Salt Lake City, UT]

78-002172 Smith, D. A. STATE VIEW OF ENDANGERED SPECIES MANAGEMENT. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 287-290. July 1977. SFA 23(3)
[Utah State Div. Wildl. Resour., Salt Lake City]

78-002173 Stanley, J. G. SPECIAL SECTION: GRASS CARP IN THE UNITED STATES: INTRODUCTION. Trans. Am. Fish. Soc. 107 (1): 104. Jan. 1978. SFA 23(3)
[Maine Coop. Fish. Res. Unit, Univ. Me., Orono 34473]

78-002174 Sweeney, W. D. PRESERVATION AND ENHANCEMENT OF FISH AND WILDLIFE HABITAT IN THE WATER RESOURCE DEVELOPMENT PLANNING PROCESS. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 252-256. July 1977. SFA 23(3)

78-002175 Tapiador, D. D.; Henderson, H. F.; Delmendo, M. N.; Tsutsui, H. FRESHWATER FISHERIES AND AQUACULTURE IN CHINA. FAO Fish. Tech. Pap. No. 168. xii + 84p. June 1977. SFA 23(3)
[FAO of the UN, Rome, Italy]

78-002176 Welcomme, R. L.; Henderson, H. F. ASPECTS OF THE MANAGEMENT OF INLAND WATERS FOR FISHERIES. FAO Fish. Tech. Pap. No. 161. vii + 36p. Oct. 1976. SFA 23(3)
[FAO of the UN, Fish. Resour. Environ. Div., Rome, Italy]

78-002177 Wydoski, R. S. REALISTIC MANAGEMENT OF ENDANGERED SPECIES--AN OVERVIEW. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 273-286. July 1977. SFA 23(3)
[Utah Coop. Fish. Res. Unit, Utah State Univ., Logan

ADMINISTRATION AND PLANNING

78-002178 Chapman, G. A. THE ROLE OF AFS SECTIONS AT THE NATIONAL, DIVISIONAL AND CHAPTER LEVELS. Proc. Anhu. Conf. West. Assoc. State Game Fish Comm. 57: 328-330. July 1977. SFA 23(3)

78-002179 Gulland, J. A. GOALS AND OBJECTIVES OF FISHERY MANAGEMENT. FAO Fish. Tech. Pap. No. 166. vii + 14p. Mar. 1977. SFA 23(3)
[FAO of the UN, Rome, Italy] This paper discusses the problems of determining what should be the aims and objectives to be pursued when managing fisheries. The concept of maximum sustained yield (MSY) has proved useful in simple situations. A less narrowly defined objective is needed to take account of interactions between different fisheries and fish stocks; of measures of output (economic return, employment, etc.) other than the simple weight harvested; of the inputs (fuel, energy, etc.) involved in taking the catch; and of the need to balance immediate and long-term interests (i.e., between catching more fish now, and having more to catch next year or the year after). It is probably not possible to replace MSY by a single, simply defined objective that satisfies all these conditions. In practice management policies will have to be determined in each case in the light of current objectives of society, and of the scientific understanding of the stocks, bearing in mind that they will never be completely accurate. Some of the problems of providing scientific advice in a way that appropriate management decisions can be taken are discussed. Problems of stock and recruitment, interaction betweeen species, and inherent variability of natural systems are likely to present particular difficulties.

78-002180 Loftus, K. H.; Johnson, M. G.; Regier, H. A. FEDERAL-PROVINCIAL STRATEGIC PLANNING FOR ONTARIO FISHERIES: MANAGEMENT STRATEGY FOR THE 1980S. J. Fish. Res. Board Can. 35 (6): 916-927. June 1978. In English with French summ. SFA 23(3)
[Ontario Minist. Nat. Resour., Fish. Br., Toronto, ON M7A 1W3, Canada]

78-002181 Robinson, D. W. FISHERIES ADMINISTRATORS SECTION. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 331-333. July 1977. SFA 23(3)
[W. Va. Dep. Nat. Resour., Charleston]

REPORTS OF FISHERY STATIONS, STATES, ETC.

78-002182 Anonymous 80TH ANNIVERSITY THE BULLETIN MOUNT DESERT ISLAND BIOLOGICAL LABORATORY SALSBURY COVER, MAINE. Bull. Mt. Desert Island Biol. Lab. 17: xvii + 122p. 1977. SFA 23(3)
[Mt. Desert Island Biol. Lab., Salsbury Cove, ME]

HABITAT ALTERATION

78-002183 Armitage, P. D. DOWNSTREAM CHANGES IN THE COMPOSITION, NUMBERS AND BIOMASS OF BOTTOM FAUNA IN THE TEES BELOW COW GREEN RESERVOIR AND IN AN UNREGULATED TRIBUTARY MAIZE BECK, IN THE FIRST FIVE YEARS AFTER IMPOUNDMENT. Hydrobiologia 58 (2): 145-156. 4 Apr. 1978. SFA 23(3)
[Freshwater Biol. Assoc., River Lab., East Stoke, Wareham, Dorset, BH20 6bb, England] Changes in composition, numbers and biomass of benthic fauna of the Tees below Cow Green Reservior and an unregulated tributary Maize Beck were followed between 1972 and 1975 and pre- and post-impoundment conditions were compared. Species diversity was lowest just below the dam and numbers and biomass were highest 240 m downstream of the dam. Faunal densities increased in the Tees after impoundment but in Maize Beck no major changes were observed.

78-002184 Banta, J. S. ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS. VOLUME IV: REGULATORY FRAMEWORK FOR PROTECTING LIVING RESOURCES. U.S. Fish Wildl. Serv. FWS/OBS-77/15. xi + 126p. Mar. 1978. Available from U.S. FWS, Natl. Coastal Ecosystems Team, NSTL Station, MS 39529. SFA 23(3)
[Conserv. Found., 1717 Massachusetts Ave., NW, Washington, DC 20036]

78-002185 Best, L. B.; Varland, K. L.; Dahlgren, R. B. EFFECTS OF STREAM CHANNELIZATION ON LAND-USE PRACTICES IN IOWA. Iowa State J. Res. 52 (4): 411-423. May 1978. SFA 23(3)
[Dep. Anim. Ecol., Iowa State Univ., Ames 50011]

78-002186 Bovee, K. D.; Cochnauer, T. DEVELOPMENT AND EVALUATION OF WEIGHTED CRITERIA, PROBABILITY-OF-USE CURVES FOR INSTREAM FLOW ASSESSMENTS: FISHERIES. U.S. Fish Wildl. Serv. Instream Flow Inf. Pap. No. 3. FWS/OBS-77/63. ix + 39p. Dec. 1977. SFA 23(3)
[Geol. Dep., Univ. Montana, Missoula] This information paper documents the methods and procedures used in the construction of probabliity criteria curves. Weighted criteria are used to assess the impacts of altered streamflow regimes on a stream habitat. They are developed primarily for those habitat parameters most closely related to stream hydraulics: depth, velocity, substrate, and temperature. Guidelines for data collection, analysis and curve development are discussed.

78-002187 Bovee, K. D. PROBABILITY-OF-USE CRITERIA FOR THE FAMILY SALMONIDAE. U.S. Fish Wildl. Serv. Instream Flow Inf. Pap. No. 4. FWS/OBS-78/07. vii + 80p. Jan. 1978. SFA 23(3)
[Geol. Dep., Univ. Montana, Missoula] The report gives the probability-of-use criteria for the hydraulic parameters of depth, velocity, substrate and temperature for the family Salmonidae. It is intended as a companion document to Instream Flow Information Paper No. 3, "Development and Evaluation of Weighted Criteria, Probability-of-use Curves for Instream Flow Assessments: Fisheries," which describes the techniques used to construct and criteria used to evaluate each set.

78-002188 Clark, J.; Zinn, J.; Terrell, C. ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS. VOLUME I: RECOVERY TECHNOLCGY. U.S. Fish Wildl. Serv. FWS/OBS-77/12. xiv + 226p. Mar. 1978. Available From U.S. FWS, Natl. Coastal Ecosystems Team, NSTL Station, MS 39529. SFA 23(3)
[Conserv. Found., 1717 Massachusetts Aye., NW, Washington, DC 20036]

78-002189 Clark, J.; Terrell, C. ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS. VOLUME III: EFFECTS ON LIVING RESOURCES AND HABITATS. U.S. Fish Wildl. Serv. FWS/OBS-77/14. xxiii + 220p. Mar. 1978. Available from U.S. FWS, Natl. Coastal Ecosystems Team, NSTL Station, MS 39529. SFA 23(3)
[Conserv. Found., 1717 Massachusetts Ave., NW, Washington, DC 20036]

78-002190 Corwin, R.; Heffernan, P. H. ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS. VOLUME V: REGIONAL STATUS REPORTS. PART 4: CALIFORNIA. U.S. Fish Wildl. Serv. FWS/OBS-77/16.4. xii + 154p. Mar. 1978. Available from U.S. FWS, Natl. Coastal Ecosystems Team, NSTL Station, MS 39529. SFA 23(3)
[Sch. Archit. Urban Plan., Univ. Calif., Los Angeles]

78-002191 Durkin, J. T.; Lipovsky, S. J. AQUATIC DISPOSAL FIELD INVESTIGATIONS, COLUMBIA RIVER DISPOSAL SITE, OREGON; APPENDIX E: DEMERSAL FISH AND DECAPOD SHELLFISH STUDIES. Tech. Rep. to U.S. Army Corps Eng. Waterways Exp. Stn. D-77-30. 184p. 1977. SFA 23(3)
[NMFS, Hammond, OR 97121]

78-002192 Edwards, C. J. THE EFFECTS OF CHANNELIZATION AND MITIGATION ON THE FISH COMMUNITY AND POPULATION STRUCTURE IN THE OLENTANGY RIVER, OHIO. Ph.D. dissertation, Ohio State Univ. 176p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8):3583. Feb. 1978. SFA 23(3)
Thirteen electrofishing surveys were completed between the period 1974-1976 on a channeled segment, a channeled segment with mitigation, and a natural segment of the Olentangy River, Ohio. Results indicated that while certain populations were enhanced or unaffected, most were detrimentally affected by conventional channelization and channelization with mitigation when compared to the natural area of the river. The mitigated area maintained a community structure inferior to the natural area, but was successful in ameliorating recovery and reducing losses when compared to the conventionally channeled area.--From abstr.

78-002193 Edwards, R. J. THE EFFECT OF HYPOLIMNION RESERVOIR RELEASES ON FISH DISTRIBUTION AND SPECIES DIVERSITY. Trans. Am. Fish. Soc. 107 (1): 71-77. Jan. 1978. SFA 23(3)
[Dep. Zool., Univ. Tex., Austin 78712]

78-002194 Garton, J. E.; Summerfelt, R. C.; Toetz, D.; Wilhm, J.; Jarrell, H. PHYSIOCOCHEMICAL AND BIOLOGICAL CONDITIONS IN TWO OKLAHOMA RESERVOIRS UNDERGOING ARTIFICIAL DESTRATIFICATION. U.S. Dep. Inter. Bur. Reclam. REC-ERC-77-6. iv + 77p. Apr. 1977. SFA 23(3)
[Okla. State Univ., Stillwater] The purpose of this study was to develop more efficient methods of reservoir reaeration and to determine the environmental effects of reservoir destratification. The Garton pump, a low evergy, axial flow device, is designed to pump water from the surface downward to destratify and reaerate lakes and reservoirs. A 1.07-m-diameter version of the device was tested in Ham's Lake (40 ha surface area, 10 m maximum depth) near Stillwater, Okla., in 1973 and 1974, and a 1.83-m-diameter version was operated in 1975. Complete thermal destratification was obtained. A 5-m-diameter version of the Garton Pump was operated in Lake of the Arbuckles (951 ha surface area, 27 m maximum depth) near Sulphur, Okla., in 1974 and 1975. Improvements in the design resulted in substantial perturbation of physiocochemical conditions of Lake of the Arbuckles in 1975. This report describes vertical variations in the two reservoirs of: (1) temperature, dissolved oxygen, and several other physicochemical parameters; (2) species composition and density of the algae populations; (3) species composition and diversity of zooplankton; (4) species composition, diversity, and density of benthic macroinvertebrates; and (5) vertical (bathymetric) distribution and growth of fish. The report also includes recommendations for further research.

78-002195 Gelroth, J. V.; Marzolf, G. R. PRIMARY PRODUCTION AND LEAF-LITTER DECOMPOSITION IN NATURAL AND CHANNELIZED PORTIONS OF A KANSAS STREAM. Am. Midl. Nat. 99 (1): 238-243. Jan. 1978. SFA 23(3)
[Konza Prairie Res. Nat. Area, Rt. 2, Manhattan, KS 66502] The channelized portion of a second-order Kansas Flint Hills stream had higher photosynthetic rates in midsummer and lower leaf degradation rates in winter than the more natural portion of the stream. Photosynthesis/respiration ratios were less than one in the natural portion but greater than one in the channelized portion of the stream. Hackberry (/Celtis occidentalis/) leaves were degraded faster than chinquapin oak (/Quercus muehlenbergii/) leaves, losing an average of 90 percent and 50 percent, respectively, after 16 weeks in the stream. Degradation was faster in the natural portion than in the channelized portion.

78-002196 Goodman, J.; Klose, P. ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS. VOLUME V: REGIONAL STATUS REPORTS. PART 2: MID AND SOUTH ATLANTIC. U.S. Fish Wildl. Serv. FWS/OBS-77/16.2. ix + 93p. Mar. 1978. Available from U.S. FWS, Natl. Coastal Ecosystems Team, NSTL Station, MS 39529. SFA 23(3)
[Coll. Mar. Sci., Univ. Del., Newark]

78-002197 Helfrich, P. AN ASSESSMENT OF THE EXPECTED IMPACT OF A DREDGING PROJECT FOR PALA LAGOON, AMERICAN SAMOA. Univ. Hawaii Sea Grant Tech. Rep. UNIHI-SEAGRANT-TR-76-02. viii + 76p. Oct. 1975. SFA 23(3)

78-002198 Hershman, M. J.; Feldmann, J. H. ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS. VOLUME V: REGIONAL STATUS REPORTS. PART 5: ALASKA, WASHINGTON AND OREGON. U.S. Fish Wildl. Serv. FWS/OBS-77/16.5. xi + 127p. Mar. 1978. Available from U.S. FWS, Natl. Coastal Ecosystems Team, NSTL Station, MS 39529. SFA 23(3)
[Inst. Mar. Stud., Univ. Wash., Seattle]

78-002199 Logan, W. D. GOSHUTE CREEK HABITAT IMPROVEMENT FOR AN ENDANGERED SUBSPECIES OF CUTTHROAT TROUT. Cal-Neva Wildl. Trans. 1977: 75-79. 1977. Copies available from The Wildlife Society, 4606 San Marino Drive, Davis, CA 95616. SFA 23(3)
[Bur. Land Manage., Ely, NV] Goshute Creek is a small stream in eastern Nevada that provides habitat for an endangered subspecies of cutthroat trout (/Salmo clarki/ spp). A stream habitat survey in 1975 identified two sections of the stream in which intensive erosion was occurring. With monies received in association with the Sikes Act, the Bureau of Land Management in Ely, Nevada, constructed three large open-mesh wire gabions in the stream channel to stop headcutting of the stream bed. The upper gabion is 60 feet long, 30 feet wide, and 28 feet high. The lower gabion is 39 feet long, 30 feet wide, and 13 feet high with a metal fish pass secured to the outside panel to facilitate fish movement up and down the stream. The third gabion is 6 feet long, 30 feet wide, and 5 feet high. Construction was accomplished by awarding a contract to a private contractor for $33,696 which included special environmental needs for Goshute Creek. These structures are designed to improve habitat on 3 miles of Goshute Creek.

78-002200 Lorenzen, M.; Fast, A. A GUIDE TO AERATION/CIRCULATION TECHNIQUES FOR LAKE MANAGEMENT. U.S. Environ. Prot. Agency Natl. Environ. Res. Cent. Ecol. Res. Ser. EPA-600/3-77-004. xvi + 126p. Jan. 1977. SFA 23(3)
[Tetra Tech, Inc., Lafayette, CA 94549]

78-002201 Massey, L. L. EFFECTS OF OFFSHORE PETROLEUM PLATFORMS ON THE AVAILABILITY OF DEMERSAL FISHERY RESOURCES IN THE NORTH CENTRAL GULF OF MEXICO. Ph.D. dissertation, Univ. South. Miss. 102p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(5):2020. Nov. 1977. SFA 23(3)
The data indicated that a strong cause-and-effect relationship did not exist between the density of platforms or wells and the availability of finfish, crustaceans, or noncrustacean invertebrates. The results of the analyses do not implicate the presence of offshore platforms at the present density as a threat to the availability of fishery resources for the demersal trawl fisheries in the north central Gulf of Mexico from depths of 9 to 90 m.--From abstr.

78-002202 McNatt, P. M. ZOOPLANKTON SPECIES COMPOSITION, ABUNDANCE, AND DISTRIBUTION IN A DESERT, PUMPED-STORAGE RESERVOIR. Ph.D. dissertation, Ariz. State Univ. 280p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(3):1034. Sept. 1977. SFA 23(3)

78-002203 Mumphrey, A. J.; Carlucci, G. D. ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS. VOLUME V: REGIONAL STATUS REPORTS. PART 3: GULF COAST REGION. U.S. Fish Wildl. Serv. FWS/OBS-77/16.3. xii + 158p. Mar. 1978. Available from U.S. FWS, Natl. Coastal Ecosystems Team, NSTL Station, MS 39529. SFA 23(3)
[Urban Stud. Inst., Univ. New Orleans, New Orleans, LA]

78-002204 Newbold, J. D. THE USE OF BENTHIC MACRCINVERTEBRATES AS INDICATORS OF LOGGING IMPACT ON STREAMS WITH AN EVALUATION OF BUFFER STRIP EFFECTIVENESS. Ph.D. dissertation, Univ. Calif. (Berkeley) 107p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8):3536. Feb. 1978. SFA 23(3)

78-002205 Porter, M. E. EFFECTS OF STREAM CHANNELIZATION ON THE MACROBENTHIC AND FISH COMMUNITIES OF THE LITTLE AUGLAIZE RIVER, OHIO. Ph.D. dissertation, Ohio State Univ. 190p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8):3589. Feb. 1978. SFA 23(3)
Differences in macroinvertebrate and fish populations were evaluated between channelized and unchannelized stream sections of the Little Auglaize River, Ohio, 1971-1972. A channelized sampling station was established about 3 kilometers downstream from an unchannelized sampling area. Both sites were atypical of the watershed because the stream was entrenched to dolomite bedrock in this area. Channel modifications had lowered stream velocity, reduced bank cover, and formed thicker deposits of relatively smaller, more uniform sediments over the bedrock bottom. Sample yields fluctuated similarly throughout the year but higher standing crops of benthos, aufwuchs, and drifting macroinvertebrates were found in the channelized section. Effects of channelization on macroinvertebrates did not seem extremely adverse although the composition of benthos, aufwuchs, and drift was distinctly different in the two stream sections. Diversity analysis indicated the macroinvertebrate community of the channelized section was slightly less stable than that of the unchannelized stream's macroinvertebrate community. Channelization effects on macroinvertebrate populations were possibly reduced because the unchannelized stream section acted as a feeder system for the channelized section. Stream conditions seemed more favorable for fish populations in the unchannelized area than in the channelized section. More fish and more fish species were found in unchannelized samples. Visibly greater fish habitat existed at the unchannelized station. Potential fish food was less abundant in the channelized section because of reduced terrestrial drifters and a preponderance of burrowers in macroinvertebrates.--From abstr.

78-002206 Prince, E. D. THE BIOLOGICAL EFFECTS OF ARTIFICIAL REEFS IN SMITH MOUNTAIN LAKE, VIRGINIA. Ph.D. dissertation, Va. Polytech. Inst. & State Univ. 302p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(3):982. Sept. 1977. SFA 23(3)
Artificial reefs were installed in Smith Mountain Lake, Virginia, during the summer and fall of 1973 to evaluate the biological effects on the aquatic ecosystem. Virtually all sport fishes were attracted to the reef areas. The frequency of sport fish on the reefs generally coincided with their overall abundance in the reservoir. Sunfishes (/Lepomis/ spp.) and white catfish were the most common. Centrarchid basses were also well represented in the reef sport fish community. The results of this study show a net beneficial biological effect on artificial reefs on the aquatic ecosystem of Smith Mountain Lake, Virginia, and indicate that artificial reefs placed in structure deficient freshwater lentic environments are a viable fisheries management tool.--From abstr.

78-002207 Reynolds, J. B. MISSOURI RIVER NOTCHED DIKE STUDY ANNUAL COMPOSITE REPORT--1977. Prepared for U.S. Army Corps Eng., Kansas City and Omaha Dist. i + 14p. 1977. SFA 23(3)

[Mo. Coop. Fish. Res. Unit, Stephens Hall, Univ. Mo., Columbia 65201] Dikes and revetments are used extensively on the Missouri River to maintain a navigation channel and to stablilze the river banks. These structures have resulted in reduced habitat diversity for fish and wildlife. To reduce further habitat losses the Corps of Engineers has notched several hundred dikes and revetments along the River from the head of navigation to its confluence with the Mississippi. To determine the effects of this notching program on fish, and to a lesser extent, wildlife, a cooperative study is presently underway involving the Corps of Engineers, the Fish and Wildlife Service, and conservation agencies of the states of Missouri, Kansas, Iowa and Nebraska, the University of Missouri, the University of Kansas, and Iowa State University. Preliminary results of the first year of the two year study indicate: 1) that notched structures create types of habitat that are not provided by unnotched structures, 2) that certain species of fish are attracted to the habitats created by notched structures, and 3) that the most beneficial types of habitat created seem to be relatively large surface areas of quiet, slack water during medium to low river stages. Another observation is that habitats created by notched dikes are constantly changing. A tentative conclusion is that notches should be placed in structures so that high stage flows can sweep through backwater areas to scour and transport sediments; otherwise, backwater areas may become filled with sediment and eventually become part of the permanent floodplain.

78-002208 Stevens, D. E. EFFECTS OF WATER DEVELOPMENT ON STRIPED BASS SURVIVAL IN THE SACRAMENTO-SAN JOAQUIN ESTUARY CALIFORNIA. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 302. July 1977. Abstract Only. SFA 23(3)

[Bay-Delta Fish. Proj., Calif. Dep. Fish Game, Stockton] The abundance of young and adult striped bass in the Sacramento-San Joaquin Estuary is related to the magnitudes of water diversions and of water flows in the estuary. Principal variations in survival occur during the first two months of life. Density-independent mortality caused by the loss of young bass in water diversions is a major factor regulating population size. Population size also is directly related to flow rates, which serve to control the transport of young bass to suitable nursery areas, which in turn probably influence survival through factors such as food availability.

78-002209 Tippie, V.; Robadue, D. ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS. VOLUME V: REGIONAL STATUS REPORTS. PART 1: NEW ENGLAND. U.S. Fish Wildl. Serv. FWS/OBS-77/16.1. ix + 67p. Mar. 1978. Available from U.S. FWS, Natl. Coastal Ecosystems Team, NSTL Station, MS 39529. SFA 23(3)

[Mar. Resour. Inf. Cent., Naragansett Bay Campus, Univ. R.I., Naragansett]

78-002210 U.S. Environmental Protection Agency REVIEW OF ENVIRONMENTAL ISSUES OF THE TRANSPORTATION OF ALASKAN NORTH SLOPE CRUDE OIL. U.S. Environ. Prot. Agency Res. Rep. Ser. EPA-600/7-77-046. xv + 123p. May 1977. SFA 23(3)
[Washington, DC 20460]

78-002211 Zinn, J. ENVIRONMENTAL PLANNING FOR OFFSHORE OIL AND GAS. VOLUME II: EFFECTS ON COASTAL COMMUNITIES. U.S. Fish Wildl. Serv. FWS/OBS-77/13. xi + 60p. Mar. 1978. Available from U.S. FWS, Natl. Coastal Ecosystems Team, NSTL Station, MS 39529. SFA 23(3)
[Conserv. Found., 1717 Massachusetts Ave., NW, Washington, DC 20036]

HARVEST, CREEL CENSUS

78-002212 FAO of the UN 1976 YEARBOOK OF FISHERY STATISTICS. CATCHES AND LANDINGS. VOL. 42. FAO Fish Ser. 6: xxii + 323p. 1977. In English, French, and Spanish. SFA 23(3)
[Rome, Italy]

78-002213 FAO of the UN 1976 YEARBOOK OF FISHERY STATISTICS. FISHERY COMMODITIES. VOL. 43. FAO Fish Ser. 7: xix + 336p. 1977. In English, French, and Spanish. SFA 23(3)
[Rome, Italy]

78-002214 Huntsman, G. R.; Colby, D. R.; Dixon, R. L. MEASURING CATCHES IN THE CAROLINA HEADBOAT FISHERY. Trans. Am. Fish. Soc. 107 (2): 241-245. Mar. 1978. SFA 23(3)
[NMFS, Beaufort, NC 28516]

78-002215 Malvestuto, S. P.; Davies, W. D.; Shelton, W. L. AN EVALUATION OF THE ROVING CREEL SURVEY WITH NONUNIFORM PROBABILITY SAMPLING. Trans. Am. Fish. Soc. 107 (2): 255-262. Mar. 1978. SFA 23(3)
[Auburn Univ. Agric. Exp. Stn., Auburn Univ., Auburn, AL 36830]

78-002216 Nicholson, W. R. GULF MENHADEN, /BREVOORTIA PATRONUS/, PURSE SEINE FISHERY: CATCH, FISHING ACTIVITY, AND AGE AND SIZE COMPOSITON, 1964-73. NOAA Tech. Rep. NMFS SSRF- 722. iii + 8p. Mar. 1978. SFA 23(3)
[NMFS, Southeast Fish. Cent., Beaufort, NC 28516] The menhaden purse seine fishery in the Gulf of Mexico, primarily for Gulf menhaden, /Brevoortia patronus/, extends from about early April to early October. From 1964 to 1973 the catch fluctuated between 317,000 and 728,000 t and the number of vessels ranged from 65 to 82. Larger and faster refrigerated vessels replaced most of the smaller nonrefrigerated vessels and modern methods of fishing were adopted. Population levels were high and there were no large fluctuations in year class abundance. Age-1 and -2 fish supplied from 95 to 99 percent of the catch by weight. Over 97 percent of the fish were between 120 and 225 mm fork length. The mean age and size generally were slightly greater in the center of the fishery (central and eastern Louisiana) than in the eastern (Mississippi) and western areas (western Louisiana and texas). Mean age decreased as the seascn progressed.

78-002217 Parks, N. B. THE PACIFIC NORTHWEST COMMERCIAL FISHERY FOR AMERICAN SHAD. Mar. Fish. Rev. 40 (2): 29-31. Feb. 1978. SFA 23(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

FISH CONTROL AND REMOVAL

78-002218 Binns, N. A. EFFECTS OF ROTENONE TREATMENT ON THE FAUNA OF THE GREEN RIVER, WYOMING. Wyo. Game Fish Comm. Fish. Tech. Bull. No. 1. 114p. 1967. SFA 23(3)
[Wyo. Game Fish Dep., Lander]

78-002219 Ryan, J. H. NONGAME FISH CONTROL AT FRENCHMAN RESERVOIR, PLUMAS COUNTY, CALIFORNIA. Calif. Dep. Fish Game Inland Fish. Admin. Rep. No. 78-1. 25p. Jan. 1977. SFA 23(3)
[Calif. Dep. Fish Game, Sacramento] The California Department of Fish and Game successfully rejuvenated Frenchman Reservoir with antimycin A in November 1975 to eradicate golden shiners (/Notemigonus crysoleucas/) and restore the trout fishery. The effect of the chemical on plankton populations was minimal. At maximum pool spillway elevation 1,709 m (5,607 ft), Frenchman Reservoir covers 640 ha (1,580 surface acres) and contains a total of 67.8 hm^3 (55,000 acre-ft) of water with a maximum depth of 31 m (102 ft). It is drawn down annually to about 46.9 hm^3 (38,000 acre-ft) for irrigation demand. For treatment, the drawdown continued to 30.8 hm^3 (25,000 acre-ft). Approximately, 757 liters (200 gal) of antimycin A (Fintrol-concentrate) were used at a concentration of 2.46 ug/l (ppb) active ingredient. The chemical cost $37,900, about $0.0123/$m^3$ ($1.52 per acre-ft). Live golden shiners were placed in cages throughout the lake before treatment to determine the effectiveness of the treatment. The rate of detoxification was monitored using live-caged fingerling and catchable rainbow trout (/Salmo gairdneri/). Total detoxification took 40 days. After detoxification, the reservoir was immediately restocked with 100,000 catchable at 0.15/kg (3.5/lb) and 100,000 fingerling at 23/kg (50/lb) rainbow trout. Additional rainbow trout were stocked later in the year. The Fish and Game Commission closed the lake to angling after it was treated. The lake was reopened on April 24, 1976. An opening weekend creel check in 1976 showed a catch per hour of 2.1 trout. Stocked trout were caught throughout the season.

MARKING AND TAGGING

78-002220 Rawstron, R. R.; Pelzman, R. J. COMPARISON OF FLOY INTERNAL ANCHOR AND DISK DANGLER TAGS ON LARGEMOUTH BASS (/MICROPTERUS SALMOIDES/) AT MERLE COLLINS RESERVOIR. Calif. Fish Game 64 (2): 121-123. Apr. 1978. SFA 23(3)
[Calif. Dep. Fish Game, 987 Jedmith Dr., Sacramento 95819]

78-002221 Smith, G. E. AN EVALUATION OF DISK-DANGER TAG SHEDDING BY STRIPED BASS (/MORONE SAXATILIS/) IN THE SACRAMENTO-SAN JOAQUIN ESTUARY. Calif. Fish Game 64 (2): 93-97. Apr. 1978. SFA 23(3)
[Calif. Dep. Fish Game, Environ. Serv. Br., Sacramento] A total of 1,162 striped bass (/Morone saxatilis/) was tagged with disk-dangler tags below the anterior and posterior dorsal fins. Tags from 337 of these fish were returned within 7 years. Tags attached below the anterior fin, the normal tagging location, experienced no immediate losses and annual losses of 4.9 percent for 4 years thereafter. Tags below the posterior fin experienced 5.6 percent immediate and 8.4 percent annual losses.

78-002222 Thresher, R. E.; Gronell, A. M. SUBCUTANEOUS TAGGING OF SMALL REEF FISHES. Copeia 1978 (2): 352-353. 5 May 1978. SFA 23(3)
[A-002, Scripps Inst. Oceanogr., La Jolla, CA 92093]

STOCKING AND INTRODUCTIONS

78-002223 Bottroff, L. J.; Lembeck, M. E. FISHERY TRENDS IN RESERVOIRS OF SAN DIEGO COUNTY, CALIFORNIA, FOLLOWING THE INTRODUCTION OF FLORIDA LARGEMOUTH BASS, /MICROPTERUS SALMOIDES FLORIDANUS/. Calif. Fish Game 64 (1): 4-23. Jan. 1978. SFA 23(3)
[Calif. Dep. Fish Game, 11595 Eucalyptus Hills Drive, Lakeside 92040] The impact of Florida bass introductions in four San Diego County, California reservoirs (El Capitan, Sutherland, San Vicente, and Lower Otay), was evaluated from 1965 through 1976. Florida bass hybridized with resident northern stocks in all test waters. Bass populations rapidly assumed Florida-like characteristics at Sutherland and Lower Otay reservoirs and a similar, although less complete, transition occurred at San Vicente Reservoir. By contrast, the bass population at El Capitan Reservoir has remained in a comparatively stable hybridized state for a number of years. Northern bass grew slightly faster than Florida bass during their first year of life. In subsequent years, Florida bass grew at substantially faster rates. Florida bass are less vulnerable to angling than northern or hybrid bass and populations with Florida-like characteristics are resistant to overharvest by anglers. The mean size of bass caught and the incidence of trophy specimens has increased in reservoirs where Florida bass have been established. Increased bass yields were associated largely with the development of hybridized populations although one impoundment containing bass with Florida-like characteristics provides angling of exceptional quality. Bluegill yields have declined markedly in reservoirs where Florida bass were introduced.

78-002224 Fraser, J. M. COMPARATIVE RECOVERIES OF PLANTED YEARLING AND FALL-FINGERLING BROOK TROUT (/SALVELINUS FONTINALIS/) FROM ONTARIO LAKES. J. Fish. Res. board Can. 35 (4): 391-396. Apr. 1978. In English with French summ. SFA 23(3)
[Ontario Minist. Nat. Resour., Fish Wildl. Br., Maple, ON L0J 1E, Canada]

78-002225 Soldwedel, R. H. SEE HOW THEY GROW. N.J. Outdoors 5 (3): 6-7. May-June 1978. SFA 23(3)
[N. J. Div. Fish Game Shellfish, Trenton] A progress report on lake trout introductions.--RS

78-002226 St. Amant, J. A. SOME PROBLEMS WITH EXOTIC INTRODUCTIONS. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 247-251. July 1977. SFA 23(3)
[Calif. Dep. Fish Game, Sacramento]

78-002227 Wahle, R. J.; Vreeland, R. R. BIOECONOMIC CONTRIBUTION OF COLUMBIA RIVER HATCHERY FALL CHINOOK SALMON, 1961 THROUGH 1964 BROODS, TO THE PACIFIC SALMON FISHERIES. NOAA Fish. Bull. 76 (1): 179-208. Jan. 1978. SFA 23(3)
[NMFS, 811 NE Oregon St., P.O. Box 4332, Portland, OR 97208] This experiment was designed to estimate the contribution to sport and commercial fisheries of the 1961 through 1964 broods of fall chinook salmon, /Oncorhynchus tshawytscha/, from 13 rearing facilities on the columbia River. These facilities reared 90 percent of the Columbia River hatchery fall chinook salmon during the four brood years. Marks common to all facilities were applied to 21.3 million of the 213 million 1961-64 brood fish released. Special marks were applied to 9.6 million fish at 11 of the study hatcheries. Sampling for the marks took place from 1963 through 1969. During the 7 yr of sampling, 65,620 chinook salmon with common and 22,090 fish with special marks were estimated to have been caught in marine commercial and sport fisheries from Pelican, Alaska, to Avila Beach, Calif., and Columbia River fisheries. The potential contribution for the four broods from the 13 study facilities, after adjustment for the effects of marking, was 1, 433,300 fish. The value of the contribution was estimated at $12,027, 000. Costs applicable to rearing were $2,859,700, yielding an average benefit to cost ratio of 4.2 to 1. Benefit to cost ratios at the 11 special mark hatcheries ranged from 0.3 to 1 to 17.1 to 1.

FISHING GEAR AND TECHNIQUES

78-002228 Eldridge, P. J.; Beery, F. H.; Miller, M. C. III DIURNAL VARIATIONS IN CATCHES OF SELECTED SPECIES OF ICHTHYONEUSTON BY THE BOOTHBAY NEUSTON NET OFF CHARLESTON, SOUTH CAROLINA. NOAA Fish. Bull. 76 (1): 295-297. Jan. 1978. SFA 23(3)
[Mar. Resour. Res. Inst., S. Car. Wildl. Mar. Res. Dep., P.O. Box 12559, Charleston 29412]

78-002229 Gale, W. F.; Mohr, H. W., Jr. LARVAL FISH DRIFT IN A LARGE RIVER WITH A COMPARISON OF SAMPLING METHODS. Trans. Am. Fish. Soc. 107 (1): 46-55. Jan. 1978. SFA 23(3)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603]

78-002230 Gilmore, R. G.; Holt, J. K.; Jones, R. S.; Kulczycki, G. R.; MacDowell, L. G. III; Magley, W. C. PORTABLE TRIPOD DROP NET FOR ESTUARINE FISH STUDIES. NOAA Fish. Bull. 76 (1): 285-289. Jan. 1978. SFA 23(3)
[Harbor Branch Found., Inc., RFD 1, Box 196 Fort Pierce, FL 33450]

78-002231 Graser, L. F. FLOW-THROUGH COLLECTION BUCKET FOR LARVAL FISH. Prog. Fish-Cult. 40 (2): 78-79. Apr. 1978. SFA 23(3)
[TVA, Div. Forest. Fish. Wildl. Dev., Norris, TN 37828]

78-002232 Gresik, J. H. EXPERIMENTAL DEEP-WATER BOTTOM TRAWLING OFF PORTLAND, WESTERN VICTORIA. Victoria Fish. Wildl. Pap. No. 14. 39p. Dec. 1977. SFA 23(3)
[Fish. Wildl. Div., 250 Victoria Parade, East Melbourne, Victoria, Australia 3002]

78-002233 Holder, D. R. A TECHNIQUE FOR USING ROTENONE TO SAMPLE FISH POPULATIONS IN GEORGIA'S WARMWATER STREAMS. Ga. Dep. Nat. Resour. Game Fish Div. Tech. Rep. No. 1. 28p. 1975. SFA 23(3)
[Dep. Nat. Resour., Game Fish Div., P.O. Drawer 1528, Waycross, GA 31501] A procedure for quantitative sampling of fish populations in most warmwater streams with rotenone is described. The procedure includes advance planning and preparation, site selection, physical measurements, setting of the mainstream block net, rotenone application, rotenone detoxification, pick up of fish, and clean up operations. The results of using this technique in collecting 25 fish samples on nine different Georgia streams are presented.

78-002234 Kjelson, M. A.; Johnson, G. N. CATCH EFFICIENCIES OF A 6.1-METER OTTER TRAWL FOR ESTUARINE FISH POPULATIONS. Trans. Am. Fish. Soc. 107 (2): 246-254. Mar. 1978. SFA 23(3)
[U.S. FWS, 4001 N. Wilson Way, Stockton, CA 95205]

78-002235 Maksimov, Yu. M. PECULIARITIES IN THE MANIFESTATION OF CERTAIN DEFENSIVE REACTIONS OF PELAGIC FISHES FROM THE GULF OF MEXICO IN THE AREA FISHED BY AN ELECTRIFIED BOTTOM TRAWL. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (2): 305-312. 1977. SFA 23(3)
[SEKB, Klaypeda, USSR] The peculiarities in the manifestation of certain defensive behavioral reactions of pelagic fishes (escape, optomotor reaction) when entering the electric field of a trawl with parameters of a pulsed current f = 20-25 Hz; Ja = 4-6 kA; T = 1.6 msec are examined. An attempt is made to explain some defensive reactions of fish affected by an electrical field from the point of view of natural responses to dangers encountered in nature. There is need to select such parameters for the electric current and designs for the electrification of a trawl in order to neutralize the manifestation of defensive reactions and increase the efficiency of present trawling gear.

78-002236 Marquez, D. J. COMPARATIVE EFFICIENCY OF DIFFERENT TYPES OF BAITING POSITIONS IN TUNA LONGLINE FISHING. Philipp. J. Fish. 14 (2): 258-270. July-Dec. 1976. SFA 23(3)
[Bur. Fish. Aquatic Resour., 860 Quezon Ave., Quezon City, Philippines] Three types of baiting positions for tuna longline fishing namely, horizontal, vertical and upside down, were experimented by the bureau of Fisheries and Aquatic Resources of the Philippines, to determine the most effective type in terms of catch, bait loss and bait recovery. Analysis of the data collected by t-test at 5 percent significance level showed a tendency of more fish to be caught by horizontal baiting type than by vertical or upside down types and with a significantly higher bait loss and lower bait recovery.

78-002237 Matuda, K.; Sannamiya, N. THEORY AND DESIGN OF BOTTOM DRIFT NET--III. ANALYTICAL SOLUTIONS OF EQUATION OF MOTION OF GEAR. Bull. Jpn. Soc. Sci. Fish. 44 (1): 7-13. Jan. 1978. SFA 23(3)
[Tokyo Univ. Fish., Minato-ku, Tokyo, Japan]

78-002238 Shomura, R. S. , (ed.) COLLECTION OF TUNA BAITFISH PAPERS. NOAA Tech. Rep. NMFS Circ. 408. iii + 167p. Dec. 1977. SFA 23(3)
[NMFS, Southwest Fish. Cent., Honolulu, HI 96812] A collection of 20 papers.--RS

78-002239 Winstanley, R. H. EXPERIMENTAL BEAM TRAWLING IN VICTORIAN WATERS. Victoria Fish. Wildl. Pap. No. 12. 11p. Sept. 1977. SFA 23(3)
[Fish. Wildl. Div., 250 Victoria Parade, East Melbcurne, Victoria, Australia 3002]

FERTILIZATION OF WATER AND SOIL

78-002240 Buck, D. H.; Baur, R. J.; Rose, C. R. UTILIZATION OF SWINE MANURE IN A POLYCULTURE OF ASIAN AND NORTH AMERICAN FISHES. Trans. Am. Fish. Soc. 107 (1): 216-222. Jan. 1978. SFA 23(3)
[Ill. Nat. Hist. Surv., Kinmundy 62854]

78-002241 Robinson, D. G.; Barraclough, W. E. POPULATION ESTIMATES OF SOCKEYE SALMON (/ONCORHYNCHUS NERKA/) IN A FERTILIZED OLIGOTROPHIC LAKE. J. Fish. Res. Board Can. 35 (6): 851-860. June 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

78-002242 Sen, P. R.; Rao, N. G. S.; Chakrabarty, R. D.; Kar, S. L.; Jena, S. EFFECT OF ADDITIONS OF FERTILIZER AND VEGETATION ON GROWTH OF MAJOR INDIAN CARPS IN PONDS CONTAINING GRASS CARP. Prog. Fish-Cult. 40 (2): 69-70. Apr. 1978. SFA 23(3)
[Cent. Inland Fish. Res. Substn., Cuttack, India]

78-002243 van den Avyle, M. J. A MODELING ANALYSIS OF LAKE ECOSYSTEM RESPONSES TO INORGANIC FERTILIZATION. Ph.D. dissertation, Tex. A&M Univ. 255p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(8), Feb. 1978. SFA 23(3)

Separate mathematical models for phytoplankton and fish were developed to describe nominal dynamics and responses to single applications of fertilizer in Postoak Lake, Texas. Models were based on data from three fertilization experiments and interim periods between 1966 and 1976. Phytoplankton biomass and productivity were formulated as functions of nutrient concentrations, temperature, illumination, grazing, and sinking losses. An energetic model for bluegills, largemouth bass, and warmouth incorporated the influences of food availability, feeding selectivity, and temperature on growth of individual fish. All bluegills, and all bass and warmouth less than 90 mm SL, showed greatest growth sensitivity to increased Diptera or Ephemeroptera biomass. Responses to zooplankton were negligible for all species and sizes except the smallest bass modeled. The lack of a pronounced fertilization influenze on zooplankton abundance in 1975 in combination with the negligible zooplankton effect on simulated fish growth indicated that fertilization affected the fish by modification of benthic biomass rather than through a zooplankton food chain. Accelerated sinkage of phytoplankton following fertilization apparently was the pathway by which benthic biomass was affected by nutrient addition.--From abstr.

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

78-002244 Arnold, G. P. METHODS OF TRACKING, DEFLECTING AND COUNTING FISH IN NORTH AMERICA. Minist. Agric. Fish. Food Dir. Fish. Res. Fish. Res. Tech. Rep. No. 44. 25p. 1978. SFA 23(3)

[Dir. Fish. Res., Fish. Lab., Lowestoft, England]

78-002245 Cada, G. F.; Hergenrader, G. L. AN ASSESSMENT OF SAMPLING MORTALITY OF LARVAL FISHES. Trans. Am. Fish. Soc. 107 (2): 269-274. Mar. 1978. SFA 23(3)

[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

78-002246 Cada, G. F. THE ENTRAINMENT OF LARVAL FISHES AT TWO NUCLEAR POWER PLANTS ON THE MISSOURI RIVER IN NEBRASKA. Ph.D. dissertation, Univ. Nebr. (Lincoln) 142p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(5):2037. Nov. 1977. SFA 23(3)

78-002247 Hanson, C. H.; White, J. R.; Li, H. W. AN ALTERNATIVE APPROACH FOR DEVELOPING INTAKE VELOCITY DESIGN CRITERIA. Cal-Neva Wildl. Trans. 1977: 10-18. 1977. Copies available from The Wildlife Society, 4606 San Marino Drive, Davis, CA 95616. SFA 23(3)

[Univ. Calif., Davis 95616] Recurring fish losses at power plant cooling-water intakes demonstrate the need for improving intake design and operation to reduce the impact on aquatic resources. An approach is proposed for deriving intake velocity criteria which focuses on the interaction of bioenergetics and fish behavior. A model based on an energetic optimum and selected swimming speed is used to predict the response of fish to hydraulic flow fields. Data on oxygen consumption rates for juvenile chinook salmon (/Oncorhynchus tshawytscha/) indicate maximum energetic efficiency occurs at a swimming speed of 25 cm/sec. Juvenile chinook salmon exposed to a velocity gradient behaviorally select a velocity of approximately 21 cm/sec. These

78-002247 CONTINUED
results support the basic hypothesis that the behavioral response of fish to a hydraulic flow field is not random but is predictable in terms of an energetically optimal swimming speed for a given species and size class. Physical and biological factors which influence predictions of the model are described. Applications of the model in understanding fish response to water intakes are suggested. Limitations of this approach in establishing power plant intake design criteria are also discussed.

MATHEMATICS, STATISTICAL METHODS AND MODELING

78-002248 Blinov, V. V. MODELLING NATURAL MORTALITY IN FISH OF THE YOUNGER AGE GROUPS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (3): 511-516. 1977. SFA 23(3)
[VNIRO, Moscow, USSR]

78-002249 Crossman, E. J.; Goodchild, C. D. AN ANNOTATED BIBLIOGRAPHY OF THE MUSKELLUNGE, /ESOX MASQUINONGY/ (OSTEICHTHYES: SALMONIFORMES). R. Ont. Mus. Life Sci. Misc. Publ. 131p. 28 Feb. 1978. Available at $4.50 from Royal Ont. Mus., 100 Queen's Park, Toronto, ON M5S 2C6, Canada. SFA 23(3)
[Royal Ont. Mus., 100 Queen's Park, Toronto, ON M5S 2C6, Canada]

78-002250 Dahlberg, M. L. COMPUTER PROGRAM FOR ANALYSIS OF THE HOMOGENEITY AND GOODNESS OF FIT OF FREQUENCY DISTRIBUTIONS, FORTRAN IV. NOAA Fish. Bull. 76 (1): 285. Jan. 1978. SFA 23(3)
[NMFS, P.O. Box 155, Auke Bay, AK 99821]

78-002251 Fisheries and Environment Canada EIGHTEENTH SUPPLEMENT TO LIST OF ARTICLES IN THE TRANSLATION SERIES NO. 3926-4175. Fish. Environ. Can. Fish. Mar. Serv. Transl. Ser. No. 3926-4175. 38p. Jan. 1978. In English with French preface. SFA 23(3)
[Fish. Mar. Serv., Sci. Inf. Publ. Br., 240 Sparks St., Ottawa, ON K1A 0E6, Canada]

78-002252 Minns, C. K. A COMPUTER SIMULATION MODEL OF LABORATORY POPULATIONS OF THE GUPPY, /POECILIA RETICULATA/ (PETERS). Ph.D. dissertation, Univ. Toronto (Canada) 1974. From Diss. Abstr. Int. B Sci. Eng. 38(6):2511. Dec. 1977. SFA 23(3)

LAKE MANAGEMENT & RESEARCH

78-002253 Carr, J. E.; Martin, D. F. AERATION EFFICIENCY AS A MEANS OF COMPARING DEVICES FOR LAKE RESTORATION. J. Environ. Sci. Health A Environ. Sci Eng. 13 (1): 73-85. 1978. SFA 23(3)
[Dep. Energy Conversion Mech. Design, Univ. South Fla., Tampa 33620]

78-002254 Schneider, J. C. HISTORY OF THE WALLEYE FISHERIES OF SAGINAW BAY, LAKE HURON. Mich. Dep. Nat. Resour. Fish. Res. Rep. No. 1850. 16p. 14 Nov. 1977. SFA 23(3)

[Mich. Dep. Nat. Resour., East Lansing] The walleye population in Saginaw Bay once supported four commercial fisheries: a seine fishery in or near certain rivers, a fyke net fishery in rivers, an angling fishery through the ice on the inner part of the Bay, and a fishery using mostly trap nets and pound nets offshore. All had collapsed by the late 1940's. The final decline was traced to a series of year class failures beginning in 1944. Modest-sized year classes in the 1950's were not adequate to arrest the downward trend in the stock. The Bay and its tributaries have had a long history of water quality problems. Circumstantial evidence is presented that poor recruitment was primarily related to increased turbidity which presumably smothered eggs on the inner-bay spawning reefs. Commercial fishing, while not the primary factor initiating the decline, became relatively more intense as walleye abundance fell. Sea lamprey, rainbow smelt, and alewife probably were not primarily responsible for the decline in walleyes but smelt and alewife may suppress recovery.

RIVER AND STREAM MANAGEMENT & RESEARCH

78-002255 Gore, J. A. A TECHNIQUE FOR PREDICTING IN-STREAM FLOW REQUIREMENTS OF BENTHIC MACROINVERTEBRATES. Freshwater Biol. 8 (2): 141-151. Apr. 1978. SFA 23(3)

[Dep. Zool., Univ. Mont., Missoula 59812] A total of 225 benthic samples was taken at various riffles along the Tongue River in Montana during three separate weekly intervals in 1975. For each sample, depth, current velocity, substrate microprofile, turbulence (Froude number), and the number and kind of species present were considered. The conditions of highest faunal diversity were 75-125 cm/s current velocity at 20-40 cm depth. The optimum condition appeared to be 76 cm/s at a depth of 28 cm over medium cobble substrates. The centroids for optimum conditions of depth and current velocity for thirty-six common macroinvertebrates are also presented. Representative diagrams of the tolerance ranges of some common invertebrate species are presented. /Rhithrogena hageni/ Eaton was chosen as the indicator species since its tolerances closely matched those of the highest community diversity. The presence of /Rhithrogena/ in future samples would indicate maintenance of adequate flow conditions for the present benthic community. A method for applying these data to produce a minimum flow recommendation is discussed. If the optimum conditions can be plotted on composite hydrologic maps of depth and velocity in riffle areas at various discharges, one can predict the discharge at which the optimum conditions are eliminated and, thus, the recommended minimum discharge.

78-002256 Rehwinkel, B. J. THE FISHERY FOR PADDLEFISH AT INTAKE, MONTANA DURING 1973 AND 1974. Trans. Am. Fish. Soc. 107 (2): 263-268. Mar. 1978. SFA 23(3)

[Mont. Dep. Fish Game, Box 430, Miles City 59301]

FARM POND AND SMALL IMPOUNDMENT MANAGEMENT

78-002257 Arruda, J. A. A THEOPETICAL AND EMPIRICAL STUDY OF TROPHIC DYNAMICS IN KANSAS FARM PONDS. Trans. Kans. Acad. Sci. 79: 120-121. 1976. Abstract only. SFA 23(3)
[Div. Biol., Kans. State Univ., Manhattan]

78-002258 Barnes, M. D. AN EVALUATIION OF ARTIFICIAL CIRCULATION AS A MANAGEMENT TECHNIQUE FOR INCREASING BIOLOGICAL PRODUCTION AND FISH GROWTH IN A SMALL OHIO LAKE. Ph.D. dissertation, Ohio State Univ. 287p. 1977. From Diss. Abstr. Int. B Sci. Eng. 38(11):5166 May 1978. SFA 23(3)
A 2.6-ha eutrophic impoundment in southern Ohio, which contained a population of stunted bluegills, was artificially destratified and circulated with compressed air during the summers of 1974 and 1975 to evaluate the technique as a means of increasing forage abundance and accessibility, habitat, and growth rates of fishes. Water chemistry, phytoplankton as chlorophyll and phaeophytin, zooplankton, and benthic macroinvertebrates were studied before and during artifical circulation, and reasons for changes in these parameters are given. Fish habitat was greatly expanded by aeration of the profundal waters, and chironomid larvae and oligochaetes invaded the profundal sediments, from which they had previously been absent. Feeding habits and growth rates of bluegills did not change significantly during artifical circulation. Reasons for the failure of artificial circulation to increase bluegill growth rates are discussed, and recommendations for the use of artificial destratification and circulation in the management of warmwater fisheries are presented.

78-002259 Beyerle, G. B. RESULTS OF ATTEMPTS TO OPTIMIZE GROWTH AND SURVIVAL OF BLUEGILLS IN PONDS BY YEARLY POPULATION MANIPULATION. Mich. Dep. Nat. Resour. Fish. Res. Rep. No. 1856. 27p. 2 Dec. 1977. SFA 23(3)
[Mich. Dep. Nat. Resour., East Lansing] For 5 consecutive years bluegill populations in three ponds (1.0, 1.8, and 2.6 hectares) were manipulated to test the theory that optimum growth and survival would result if yearly survival of age-0 bluegills was restricted to less than 10,000 per hectare, and if 50 percent of all other age groups was harvested each fall when the ponds were drained. Age-0 bluegills were manipulated as planned, but the anticipated 50 percent yearly harvest of other age groups was reduced to 0-25 percent in an attempt to maintain total standing crops of approximately 100 kg per hectare. Analysis and projection of the data obtained lead to the postulation that, although the 50 percent yearly harvest of age-I and older bluegills did not permit the standing crop (expressed in weight) to expand as anticipated, a continuation of the planned harvest would have resulted in optimum sustained yield of bluegills 15.2 cm (6 inches) and larger.

78-002260 Carlander, K. D. HISTORY OF THE FISH POPULATION OF LAKE LAVERNE, IOWA STATE UNIVERSITY CAMPUS. Iowa State J. Res. 52 (4): 425-433. May 1978. SFA 23(3)
[Dep. Anim. Ecol., Iowa State Univ., Ames 50011] Changes in the fish population of Lake LaVerne from 1937 to 1977 are evident from the laboratory field records of the fishery management classes. Orangespotted and green sunfish, /Lepomis humilis/ and /L. cyanellus/, constituted most of the population in 1937-1938 and 1947-1951. Lake dredging and pesticides eliminated these fish, and goldfish

78-002260 CONTINUED
(/Carassius auratus/) constituted most of the population in 1968-1977. Green sunfish and bluegills, /Lepomis macrochirus/, increased in importance from 1970 to 1977. Many other species have been taken in small numbers inasmuch as the population is largely one of haphazard introduction. Specimens of the nonoverwintering fish, /Tilapia aurea/, were introduced in 1968 and 1969 to control algae. The goldfish showed little or no recruitment from 1968 to 1977, during which time the population declined from about 37,700 to 1,720. In most years the annual mortality was about 20-23 percent. When goldfish were abundant, the standing crop was 1,065-1,115 kg/ha compared with 110-184 kg/ha when the small sunfish constituted the population.

78-002261 Carline, R. F.; Brynildson, O. M. EFFECTS OF HYDRAULIC DREDGING ON THE ECOLOGY OF NATIVE TROUT POPULATIONS IN WISCONSIN SPRING PONDS. Wis. Dep. Nat. Resour. Tech. Bull. No. 98. 40p. 1977. SFA 23(3)

[Wis. Dep. Nat. Resour., Box 7921, Madison 56707] Since 1967 the Wisconsin Department of Natural Resources has been dredging spring ponds to increase living space for native trout populations, mostly brook trout, and to restore or enhance sport fisheries. This study, conducted from 1967-75, describes the effects of hydraulic dredging on important physico-chemical characteristics of spring ponds, with particular reference to changes in trout populations, fishing pressure, and harvest. Intensively studied ponds were 0.3 to 0.4 ha in surface area and dredging increased volumes by 400 to 500 percent. Densities of benthic organisms were severely reduced by dredging. Tubificids recolonized rapidly and became the most numerous taxa. Structures of fish communities were temporarily altered by dredging; trout accounted for most of the total fish biomass. In shallow ponds trout densities fluctuated greatly because of large-scale emigrations and immigrations. After dredging, emigrations were much reduced. When benthic densities decreased due to dredging, growth rate of trout declined. As benthic communities recolonized, trout growth rates also increased. Fishermen utilization increased at both ponds after dredging. Compared to other small lakes containing salmonids, standing crops and yields of trout from Wisconsin spring ponds were among the highest reported values. Dredging costs ranged from $0.52 to $2.07 to increase pond volumes by 1 m^3, and were inversely related to pond area. Dredging appeared to be an economically sound program on the basis of increased fisherman utilization.--From abstr.

78-002262 Patterson, D. W.; Lines, I. L. EIGHT YEARS OF RECORD ON A MANAGED WARMWATER POND. Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 336-352. July 1977. SFA 23(3)

An 8 year field trial was conducted in California's Northern Sacramento Valley on a typical warmwater farmpond. The pond was stocked with largemouth bass (/Micropterus salmoides/), bluegill (/Lepomis macrochirus/), channel catfish (/Ictalurus punctatus/) and other species. The field trial was conducted to determine if population assessment and other pond management techniques developed and practiced by the late H. S. Swingle in the Southeastern United States could be used in California. Pond fertilization was also evaluated for control of submersed aquatic vegetation. A stunted bluegill population, typical of unmanaged ponds, was also avoided. The field trial pond produced an average annual catch of 62 pounds per surface acre which is considerably more than the catch reported for larger warmwater impoundments throughout California and the United States.

78-002263 Warner, K. POPULATION AND FISHERY CHARACTERISTICS OF LANDLOCKED SALMON IN A SMALL MARINE LAKE. Prog. Fish-Cult. 40 (2): 56-58. Apr. 1978. SFA 23(3)
[Me. Dep. Inland Fish. Wildl., Bangor 04401]

LARGE IMPOUNDMENT MANAGEMENT & RESEARCH

78-002264 Balon, E. K. KARIBA: THE DUBIOUS BENEFITS OF LARGE DAMS. Ambio 7 (2): 40-48. 1978. SFA 23(3)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] the ecological consequences of dam building extend far beyond the common cost-benefit analysis. On the Zambezi River for example, a unique and stable ecological system, which took millenia to develop, was rapidly changed by dams into less productive lakes. The process was accompanied by widespread destruction and misery. The production of the electricity required for a more profitable export of mineral resources rendered the local inhabitants dependent on external sources of food, water, etc, where they had formerly been self-sufficient. The surface of the lake reflects more solar energy than the old terrestrial system. As a consequence, fish production is lower than the lost production of plants and game. Species diversity may be increased by natural invasion and artificial introduction, but the production limits of the system can not be changed.

78-002265 Makhotin, Yu. M. THE SPAWNING EFFICIENCY OF FISHES IN KUYBYSHEV RESERVOIR AND FACTORS DETERMINING IT. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 24-35. 1977. SFA 23(3)
[State Res. Inst. Lake River Fish., Kazan, USSR] long-term data on the influence of different environmental factors on the reproductive efficiency of fishes in Kuybyshev reservoir were examined. The main reason why fish catches in the reservoir do not reach the planned target is the absence of the essential conditions for reproduction for the majority of commercial fishes. The role and interrelation of the separate factors of the environment which influence the reproductive efficiency of fishes, is shown. A considerable increase in fish catches in Kuybyshev reservoir will be possible in the near future only by virtue of fisheries management measures.

78-002266 Martin, D. B.; Arneson, R. D. COMPARATIVE LIMNOLOGY OF A DEEP-DISCHARGE RESERVOIR AND A SURFACE-DISCHARGE LAKE ON THE MADISON RIVER, MONTANA. Freshwater Biol. 8 (1): 33-42. Feb. 1978. SFA 23(3)
[U.S. FWS, P.O. Box 139, Yankton, SD 57078] Phytoplankton standing crop, primary production, light penetration, temperature, and various chemical concentrations were measured in a man-made, deep-discharge, reservoir and in a natural, surface-discharge, lake in order to relate limnological conditions in the two bodies of water to their depth of outflow. The quantity and depth distribution of heat stored during the summer varied markedly. The reservoir functioned as a heat trap, whereas heat was readily dissipated from the lake. Salinity increased more in the lower layer of the lake. Throughout the summer, nutrient-rich water was discharged from the reservoir whereas nutrient-poor water was discharged from the lake. Phytoplankton standing crops were greater in the lake and were dominated by flagelates and diatoms. In the reservoir, blue-green algae were predominant. Rates of primary production and respiration were higher in the lake, but estimated algal turnover times were faster in the reservoir. It was concluded that depth of outflow has a direct and predictable effect on certain physical and chemical conditions within these two bodies of water; but

78-002266 CONTINUED
effects of discharge depth on phytoplankton were secondary and thus difficult to ascertain.

78-002267 Musina, N. Kh.; Prusevich, N. A.; Seleznev, V. V. PECULIARITIES IN THE FORMATION OF THE FISH FAUNA OF KAPCHAGAY RESERVOIR. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 9-15. 1977. SFA 23(3)
[KazNIIRKh, Ust'-Kamenogorsk, USSR] A description is given of Kapchagay reservoir. The rapid reorganization of the fish fauna is noted. Indigenous fishes were replaced by introduced species. Members of the Ponto-Caspian freshwater and Chinese lowland faunistic groupings proved most competitive under reservoir conditons. The bream, pike-perch and carp are of commercial significance.

78-002268 Petr, T. TROPICAL MAN-MADE LAKES--THEIR ECOLOGICAL IMPACT. Arch. Hydrobiol. 81 (3): 368-385. 1978. SFA 23(3)
[Zool. Dep., Monash Univ., Clayton, Victoria, Australia] The environmental impact of eight large tropical man-made lakes on three continents is reviewed. The largely speculative management of old schemes today can be replaced in new schemes by a rational approach based on sound knowledge of accummulated engineering and scientific data. It is now widely recognized that people and their socio-cultural system must be considered as part of the man-made ecosystem and that rapid amelioration of social and economic problems sould be given priority. The only large tropical reservoir of a developed country (Lake Argyle in Australia) is mentioned as an example of a missed opportunity for solid scientific environmental research.

MARINE MANAGEMENT & RESEARCH

78-002269 Dahrma Raja, S. K.; Philipose, V. TRENDS IN THE YIELDS OF MAJOR EXPLOITED FISHERIES OF THE EAST COAST OF INDIA. Indian J. Fish. 22 (1,2): 187-197. 1975. SFA 23(3)
[Cent. Mar. Fish. Res. Inst., Cochin-18, India]

78-002270 Delmendo, M. N. AN EVALUATION OF THE FISHERY RESOURCES OF LAGUNA DE BAY. Philipp. J. Fish. 14(2): 213-231. July-Dec. 1976. SFA 23(3)

78-002271 FAO of the UN REPORT OF THE FIRST SESSION OF THE WESTERN CENTRAL ATLANTIC FISHERY COMMISSION. FAO Fish. Rep. No. 172. vi + 31p. 1975. SFA 23(3)
[Rome, Italy]

78-002272 International Pacific Halibut Commission THE PACIFIC HALIBUT: BIOLOGY, FISHERY, AND MANAGEMENT. Int. Pac. Halibut Comm. Tech. Rep. No. 16. 56p. 1978. SFA 23(3)
[P.O. Box 5009, University Station, Seattle, WA 98105]

78-002273 Kesavan Nair, A. K.; Balakrishnan, G. THE BOMBAY DUCK (/HARPODON NEHEREUS/) FISHERY DURING 1950-72. Indian J. Fish. 22 (1, 2): 198-204. 1975. SFA 23(3)
[Cent. Inst. Fish. Technol., Cochin-2, India]

78-002274 Kimmerer, W. J.; Durbin, W. W., Jr. THE POTENTIAL FOR ADDITIONAL MARINE CONSERVATION DISTRICTS ON OAHU AND HAWAII. Univ. Hawaii Sea Grant Tech. Rep. UNIHI-SEAGRANT-TR-76-03. viii + 108p. Dec. 1975. SFA 23(3)

78-002275 Nikol'skiy, G. V.; Rass, T. S.; Studenetskiy, S. A. ON THE DIVISION OF THE OCEAN INTO FISHING REGIONS AND THE NOMENCLATURE OF ITS SUBDIVISIONS. J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.) 17 (1): 1-8. 1977. SFA 23(3)
[USSR Acad. Sci., Moscow, USSR] Questions connected with the division of the ocean into fishing regions and the nomenclature of its subdivisions are examined. To ensure the ordering of fisheries statistics and the organization of rational fishing we propose to make use of the experience of ICES and ICNAF for the division of the ocean into regions, and also to unify the terminology used to designate the subdivisions of the ocean, thus correcting differences and inaccuracies in the nomenclature used.

78-002276 Parks, N. B. THE PACIFIC NORTHWEST COMMERCIAL FISHERY FOR STRIPED BASS, 1922-74. Mar. Fish. Rev. 40 (1): 18-19. Jan. 1978. SFA 23(3)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

78-002277 Whyte, J. N. C.; Englar, J. R. ASPECTS OF THE PRODUCTION OF HERRING ROE ON /MACROCYSTIS INTERGRIFOLIA/ IN GEORGIA STRAIT LOCATIONS. Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 751. vi + 28p. Oct. 1977. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., 6640 N.W. Marine Dr., Vancouver, BC V6T 1X2, Canada] The herring roe on seaweed fishery in Georgia Strait suffers from the absence of the giant kelp /Macrocystis integrifolia/ in that location. Studies have revealed that the alga can be harvested, transported and held in a viable form for four weeks prior to use in propagation ponds. Salt preservation of the plant can be effected but rapid biodeterioration results from reimmersion of the preserved tissue in seawater, thus pre-season collection and storage by chemical preservation is impossible. The herring roe on seaweed assimilates salt rapidly when treated with saturated brine, a medium in which the quality can best be maintained at the lowest possible storage temperature.

REVIEWS, BIBLIOGRAPHIES, ETC.

78-002278 Gulf Coast Research Institute COASTAL MARSH PRODUCTIVITY. A BIBLIOGRAPHY. U.S. Fish Wildl. Serv. FWS/OBS-77/3. xvi + 300p. Oct. 1977. Available from U.S. Fish Wildl. Serv., Natl. Coastal Ecosystem Team, NSTL Station, MS 39529. SFA 23(3)

78-002279 Marshall, K. E.; Kays, M. AN INDEX TO THE PUBLICATIONS OF THE STAFF OF THE FRESHWATER INSTITUTE, WINNIPEG, 1976-77. Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 764. iv + 41p. Apr. 1978. In English with French summ. SFA 23(3)
[Fish. Mar. Serv., Winnipeg, MB R3T 2N6, Canada]

SPORT FISHING TECHNIQUES

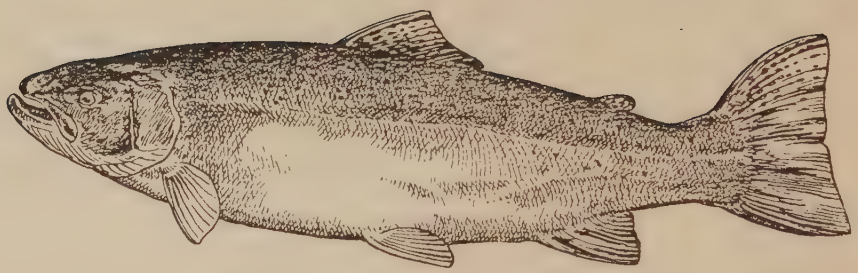
78-002280 Squire, J. L., Jr. ANGLERS' GUIDE TO THE UNITED STATES PACIFIC COAST. U.S. Dep. Commer., Natl. Mar. Fish Serv., Washington, DC v + 139p. Nov. 1977. Available from Supt. Documents, USGPO, Washington, DC 20402, as Stock No. 003-020-00113-1. SFA 23(3)
[NMFS, Southwest Fish Cent., La Jolla, CA]

WATER USE AND CONSERVATION

78-002281 Bowler, B. UTILITY OF EQUITY LAW FOR PRESERVING INSTREAM FLOWS Proc. Annu. Conf. West. Assoc. State Game Fish Comm. 57: 267-272. July 1977. SFA 23(3)
[Sonna Bldg., Boise, Idaho] The application of equity will necessarily impact the western appropriation doctrine. The first in time is the first in right if carried to its extreme is clearly unjust. That is, to continue private rights to the last of our public water is socially immoral and legally inequitable. All administrative agencies of public waters should protect minimum stream flows needed in a river for the beneficial uses of fish and wildlife, recreation, aesthetics, navigation, and other uses. Failure to do this is a violation of the equitable trust under which government agencies are required to administer public resources for the benefit of the public interest. The utter selfishness of the private appropriator who would divert the last water from a stream must be henceforth constrained by law. Since many legislatures will not act, equity has to be advocated vigorously by other trustees for the public i.e., government agencies.

78-002282 Jones, D. C.; Clark, W. S.; Holland, W. F.; Lacy, J. C.; Sethness, E. D. MONITORING ENVIRONMENTAL IMPACTS OF THE COAL AND OIL SHALE INDUSTRIES RESEARCH AND DEVELOPMENT NEEDS. U.S. Environ. Prot. Agency Res. Rep. Ser. EPA-600/7-77-015. x + 193p. Feb. 1977. SFA 23(3)
[Radian Corp., P.O. Box 9948, Austin, TX 78703]

78-002283 White, I. L.; Hall, T. A.; Chartock, M. A.; Malecki, E. J; Leonard, R. L.; Rappaport, E. B.; Ballard, S. C.; Freed, R. K.; Gilliland, M. W.; Miller, G. D.; LaGrone, F. S.; Lacy, J. C.; Bartosh, C. P.; Raye, T. D.; Cabe, D. B.; Stuart, J. D.; Eppright, B. R.; Wilson, M. L.; Grossman, D. C. ENERGY FROM THE WEST. A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT. VOLUME I. SUMMARY. U.S. Environ. Prot. Agency Res. Rep. Ser. EPA-600/7-77-072a. xxix + 153p. July 1977. SFA 23(3)
[Univ. Oklahoma, Norman]



Abbakumov, V. P.
78-001828
Abbott, T. M.
78-001829
Abdullayev, M. A.
78-001681
Abe, H.
78-001399
78-001400
Abernethy, C. S.
78-001948
Abraham, M.
78-001430
Abramowitz, J.
78-001401
Acton, A. B.
78-002006
Adam, H.
78-001387
Adams, J. C.
78-001700
Addison, R. F.
78-002077
Adron, J. W.
78-001321
78-001512
Agor-Balicanta, A.
78-001807
Ahern, T. P.
78-002042
Ahmad, J.
78-001980
Akizuki, T.
78-001944
Alderson, G. D.
78-002005
Alikin, Yu. S.
78-001575
Allen, G. R.
78-001893
Allen, H. E.
78-002115
Allen, M. J.
78-002016
Alley, D. W.
78-001638
Allison, D. T.
78-002078
Almazan, G. de J.
78-001335
Alpers, C. E.
78-001937
Altukhov, K. A.
78-001736
Amano, K.
78-001491
Amaoka, K.
78-001830
Amend, D. F.
78-001930
78-001933
78-001942
78-001973
78-001976
Andersen, K.
78-001940
Anderson, D.
78-002017
Anderson, J. W.
78-002060
78-002079
78-002080
Anderson, R. O.
78-002168
Andruetto, S.
78-001934
78-001943
Anees, M. A.
78-002081
Angus, R. A.
78-001603
78-001632
Anonymous
78-002182
Antony Raja, B. T.
78-001894
Appanna Sastry, Y.
78-001864
Arai, K.-I.
78-001455
Armitage, P. D.
78-002183
Arneson, R. D.
78-002266
Arnold, C. R.
78-001361
Arnold, G. P.
78-002244
Arruda, J. A.
78-002257
Arstila, A. U.
78-002104
Arthur, J. W.
78-002117
Atchison, G. J.
78-002148
Atkinson, E.
78-001402
Atlas, R. M.
78-002018
Austreng, E.
78-001403
Auwarter, A. G.
78-002082
Avault, J. W., Jr.
78-001481
78-001773
Ayers, R. W.
78-001349
Babayev, N. S.
78-001682
Badrudeen, M.
78-001880
Badsha, K. S.
78-001683
Bailey, C. F.
78-001404
Bailey, J.
78-001463
78-001472
Bailey, J. E.
78-001285
Bailey, W. M.
78-001884
Baird, D.
78-001684
78-001697
78-001895
Balakrishnan, G.
78-002273
Baldwin, W. J.
78-001319
Ballantyne, J. S.
78-001405

Ballard, S. C.
78-002283
Balon, E. K.
78-002264
Banowetz, G. M.
78-001587
Banta, J. S.
78-002184
Barel, C. D. N.
78-001896
Barnes, M. D.
78-002258
Barnett, J.
78-002083
Barraclough, W. E.
78-001660
78-002241
Bartlett, G. R.
78-001406
78-001407
78-001408
Barton, M.
78-001831
Bartoo, N. W.
78-001722
Bartosh, C. P.
78-002283
Basham, L.
78-001832
Bauchot, M.-L.
78-001893
Baud, C. A.
78-001377
Baur, R. J.
78-002240
Bawden, C. A.
78-002028
Beadles, J. K.
78-001837
78-001844
78-001851
Beamish, R. J.
78-001442
Bean, R. M.
78-002080
Beccaria, E.
78-001975
Beck, A. P.
78-001622
Becker, D. A.
78-001931
Beery, F. H.
78-002228
Benedict, C.
78-001762
Bengtsson, B.-E.
78-002149
Bennemann, R.
78-001409
Bennet, P. S.
78-001981
Bennett, D. H.
78-002076
Ben-Tuvia, A.
78-001758
Berenbeym, D. Ya.
78-001737
Berg, R. E.
78-001808
Bergman, H. L.
78-001446
78-001447
Bergstrom, E.
78-001494
Berrien, P.
78-001685
78-001686
Berrien, P. L.
78-001833
Berrill, M.
78-001667
Berry, D. K.
78-001834
Best, L. B.
78-002185
Beverley-Burton, M.
78-001982
Beyerle, G. B.
78-002259
Bhattacharyya, T. K.
78-001352
Bich, J. P.
78-001835
Binderim, G. E.
78-001836
Binns, N. A.
78-002218
Bird, P. M.
78-001410
Black, A.
78-001604
Blackburn, J. M.
78-001413
Blaylock, J. W.
78-002060
Blinov, V. V.
78-001885
78-002248
Blunt, B. R.
78-002107
Bodaly, R. A.
78-001605
Boehlert, G. W.
78-001639
Boehm, P. D.
78-002019
Boivin, G.
78-001377
Bondareva, V. M.
78-001547
Bonin, J. D.
78-001411
Booth, J. H.
78-001412
Bottroff, L. J.
78-002223
Botts, R. P.
78-002084
Bouck, G. R.
78-001292
Bounds, S. V.
78-001837
Bovee, K. D.
78-002186
78-002187
Bowers, M. J.
78-001887
Bowler, B.
78-002281
Boyd, C. E.
78-002153
Bradley, F.
78-002050
Bradt, P. T.
78-001343
Braid, M. R.
78-001293

Brandenberg, A. M.
78-001302
Brandes, W. F.
78-001606
78-001612
Braune, M. O.
78-001613
Bray, R. A.
78-001995
Bray, R. N.
78-001767
Bresching, G.
78-002006
Bresonik, P. L.
78-002033
Brett, J. R.
78-001413
Brinkhurst, R. O.
78-002020
Broderius, S. J.
78-002112
Brodie, P. F.
78-001350
Brodskiy, D. A.
78-001765
Brooker, M. P.
78-002072
Brooks, A. S.
78-002140
Brophy, P.
78-001842
Broughton, N. M.
78-001809
Brown, D. A.
78-002085
Brown, D. S.
78-001353
Brown, D. W.
78-002118
Bryant, M. D.
78-001723
Brynildson, O. M.
78-002261
Buangsawasdi, M.
78-002086
Buck, D. H.
78-002240
Budayeva, V. D.
78-001883
Budd, J.
78-001969
78-002101
Buhringer, H.
78-001501
Buikema, A. L., Jr.
78-002088
Bullock, A. M.
78-001414
Bulow, F. J.
78-001415
78-001591
78-001599
78-001780
78-001810
78-001983
Burns, K.
78-002066
Burns, K. A.
78-002044
Burr, B. M.
78-001607
78-001897
Burton, D.
78-001354
Burton, D. T.
78-002087
Burton, M. P.
78-001495
Busakhin, S. V.
78-001689
Busdosh, M.
78-002018
Buth, D. G.
78-001607
Butler, D. G.
78-001352
Butler, J. N.
78-002021
Buy Lay
78-002162
Buyanov, N. I.
78-001283
Cabe, D. B.
78-002283
Cada, G. F.
78-002245
78-002246
Cadwallader, P. L.
78-001344
78-001838
Cairns, J., Jr.
78-002041
78-002088
78-002089
Cairns, M. A.
78-001292
78-001416
Calamari, D.
78-002022
Cameron, J. N.
78-001417
Campos-P., V.
78-002027
Caporiccio, B.
78-001355
Caprio, J.
78-001640
Cardenas, J. M.
78-001450
Carlander, K. D.
78-002260
Carline, R. F.
78-002261
Carlucci, G. D.
78-002203
Carpenter, G. F.
78-001351
Carr, J. F.
78-002253
Carr, W. D.
78-001931
Carter, H. J.
78-001646
Caruso, J. H.
78-001898
Casteel, R. W.
78-001899
Casterlin, M. E.
78-001661
78-001662
78-001663
78-001665
Castilla, C.
78-001526

Castro, H. T.
78-002023
Caviglia, A.
78-002024
Cech, J. J., Jr.
78-001515
Chakrabarty, R. D.
78-002242
Chambolle, P.
78-001487
Chang, S.
78-001710
Chapman, D. W.
78-001811
Chapman, G. A.
78-002178
Chapman, R. W.
78-001738
Chartock, M. A.
78-002283
Chau, Y. K.
78-002161
Chaudhuri, H.
78-001295
Chavin, W.
78-001401
Chekunova, V. I.
78-001418
Chellam, A.
78-001981
Chervinski, J.
78-001336
Chess, J. R.
78-001779
Chiou, J.-Y.
78-001327
Chistobayeva, R. Ye.
78-001886
Cho, C. Y.
78-001324
Chorn, J.
78-001900
Christian, A. R.
78-001292
78-001416
Chuapoehuk, W.
78-001322
Chulitskaya, E. V.
78-001419
Churikov, A. A.
78-001696
Cisar, J. O.
78-001949
Claridge, P. N.
78-001759
Clark, J.
78-002188
78-002189
Clark, R. B.
78-002049
Clark, R. C., Jr.
78-002025
Clark, W. S.
78-002282
Clarke, W. C.
78-001284
Clemens, H. P.
78-001329
Clement, A-M.
78-001704
Cloutman, D. G.
78-001931
78-001984
Coad, B. W.
78-001901
Coburn, C. B.
78-001415
Coburn, C. B., Jr.
78-001420
Coche, A. G.
78-001280
Cochnauer, T.
78-002186
Cofield, C. R.
78-001749
Colby, D. R.
78-002214
Cole, T. J.
78-002026
Coles, S. L.
78-002051
Colin, P. L.
78-001739
78-001902
Colle, D. E.
78-001768
78-001799
Collette, B. B.
78-001903
Colwell, R. R.
78-002027
Cone, D. K.
78-001985
Conner, J. V.
78-001839
Connes, R.
78-001355
Cook, P. C.
78-001608
Cooley, J.
78-002050
Cooper, J. C.
78-001670
Cooper, J. E.
78-001904
Copes, F. C.
78-001687
Corwin, R.
78-002190
Coss, R. G.
78-001356
Coste, F.
78-002008
Cothron, P. D.
78-001420
Cousins, R. J.
78-002127
Coutermarsh, B. A.
78-001950
Covey, C. B.
78-001327
Coyne, J. A.
78-001641
Craik, J. C. A.
78-001421
Creekmore, R. C.
78-001812
Cretney, W. J.
78-002028
Crim, L. W.
78-001586
Cripe, C. R.
78-001337
Crisp, D. T.
78-001769

Croll, N. A.
78-001935
Cross, F. B.
78-001398
Crossman, E. J.
78-002249
Crunkilton, R.
78-001338
Crutcher, P. L.
78-002163
Cugurra, F.
78-002024
Curby, W. A.
78-002090
Current, W. L.
78-001956
78-001957
Dabrowska, H.
78-001323
Dabrowski, K.
78-001323
Dahlberg, M. L.
78-001285
78-002250
Dahlgren, R. B.
78-002185
Dahrma Raja, S. K.
78-002269
Daikoku, T.
78-001422
Dale, J.
78-002036
78-002042
Dalmaz, Y.
78-001423
Dangel, J. R.
78-001724
Danil'chenko, O. P.
78-002091
Datta Munshi, J. S.
78-001424
Davies, A. J.
78-001958
Davies, P. H.
78-002092
Davies, W. D.
78-002215
Davis, G. E.
78-001341
Davis, J. T.
78-001296
Davis, K. B.
78-001448
78-001593
Davis, S.
78-002139
Davitz, M. A.
78-001642
Dawson, C. E.
78-001905
78-001906
de Renzis, G.
78-001537
De Silva, S. S.
78-001770
de Vlaming, V. L.
78-001586
Dechtiar, A. O.
78-001969
Deelder, C. L.
78-001297
DeFoe, D. L.
78-002142
DeGraeve, G. M.
78-002157
DeLaney, R. G.
78-001375
Delmendo, M. N.
78-002175
78-002270
DeNike, E. E.
78-002025
Dentry, W.
78-001609
Desoutter, M.
78-001893
Desser, S. S.
78-001959
Deutsch, W. G.
78-001932
Devadoss, P.
78-001744
Devaraj, M.
78-001907
78-002010
Devitsina, G. V.
78-001425
Devitsyna, G. V.
78-001357
Dgebuadze, Yu. Yu.
78-001725
Dhulkhed, M. H.
78-001316
Dickson, K. L.
78-001829
78-002089
Dillon, P. J.
78-002029
Dirin, D. K.
78-001490
Dixon, R. L.
78-002214
Dixon, R. N.
78-002093
Doble, B. D.
78-001771
Dobrinskaya, L. A.
78-001986
Dojiri, M.
78-001987
Domanik, A. M.
78-002094
Dorozhkina, T. Ya.
78-001725
Dowling, J. E.
78-001358
78-001458
Downs, R. A.
78-001426
Driedzic, W. R.
78-001427
78-001434
78-001435
Druzhinin, A. D.
78-001688
78-001689
Dubale, M. S.
78-001359
Dubois, M. P.
78-001440
Dumont, J. N.
78-002139
Duncan, I. B.
78-001972
Dunseth, D. R.
78-001298

Durbin, W. W., Jr.
78-002274
Durkin, J. T.
78-002191
Durve, V. S.
78-001428
78-002073
Dykova, I.
78-001960
78-001961
Dzhabarov, M. I.
78-001429
Dzhumaliyev, M. K.
78-001360
Easton, K.
78-001633
Eaton, J. G.
78-001339
78-002120
Ebeling, A. W.
78-001785
Ebersole, J. P.
78-001643
Echelle, A. A.
78-001634
78-001840
Echelle, A. F.
78-001634
Echevarria, T.
78-002096
Echeverria, T.
78-002095
Eckstein, B.
78-001430
Eden, A. K.
78-001344
Edwards, C. J.
78-002192
Edwards, P. J.
78-002193
Eggers, D. M.
78-001771
Egidius, E. C.
78-001940
Egusa, S.
78-001968
Ehinger, B.
78-001358
Elcombe, C. R.
78-002144
Elder, D. L.
78-002032
Eldridge, M. B.
78-001887
78-002095
78-002096
Eldridge, P. J.
78-002228
Ellender, R. D.
78-001509
Elliott, D. G.
78-001973
Elsarnagawy, D.
78-001941
Emery, A. R.
78-001841
Eng, D.
78-001887
Englar, J. R.
78-002277
Epperly, S. P.
78-001812
Eppright, B. R.
78-002283
Erickson, J. E.
78-001690
Ersler, A. L.
78-001765
Estes, R. D.
78-001606
Etchevers, S. L.
78-001691
78-001692
Evans, D.
78-002029
Evans, G. W.
78-001756
Evans, N. A.
78-001988
Evans, W. A.
78-001931
Evelyn, T. P. T.
78-001974
Ezzi, I. A.
78-001695
Fable, W. A., Jr.
78-001361
Fagerlund, U. H. M.
78-001286
Fallon, D. J.
78-001863
FAO of the UN
78-002097
78-002212
78-002213
78-002271
Farkas, J.
78-001953
Farr, J. A.
78-001772
Farrell, A. P.
78-001431
78-001552
78-001553
78-001644
Farrington, J.
78-002066
Fast, A.
78-002200
Fay, R. C.
78-001842
Fedorov, K. Ye.
78-001432
78-001433
Fedoseyenko, V. M.
78-002126
Feldmann, J. H.
78-002198
Fel'gengauer, P. E.
78-001419
Fender, D. C.
78-001933
Ferguson, A.
78-001610
Ferguson, H. W.
78-001962
Fey, J. M.
78-002030
Fickeisen, D. H.
78-001989
Fields, J. H. A.
78-001427
78-001434
78-001435
78-001450

Filosa, M. F.
78-001592
Finan, D.
78-001685
78-001686
Fischithal, J. H.
78-001990
Fisheries and Environment Canada
78-002251
Fishman, A. P.
78-001375
Fishman, R. B.
78-001436
Fitch, J. E.
78-001843
Fitzpatrick, L. D.
78-001678
Fivizzani, A. J.
78-001645
Fletcher, C. R.
78-001437
78-001438
Fletcher, G. L.
78-001439
78-002130
Follenius, E.
78-001440
Folmar, L.
78-001630
Foltz, J. W.
78-001590
Fore, P. L.
78-002031
Forester, J.
78-002071
Forester, J. S.
78-001773
Forester, T. S.
78-001888
Forss, E. C.
78-001275
Forster, R. P.
78-001441
Foucher, R. P.
78-001442
Fowler, S. W.
78-002032
Fox, J. L.
78-002033
Frank, D. G.
78-001710
Fraser, J. M.
78-002224
Frazier, G. C.
78-001844
Frechette, J-L.
78-001991
Frederikhsen, A. V.
78-001845
Freed, R. K.
78-002283
Freeman, B. L.
78-001693
Freeman, H. C.
78-002098
French, C.
78-001427
French, C. J.
78-001434
78-001435
78-001443
Fried, S. M.
78-001760
Fryer, J. L.
78-001587
78-001942
78-001949
Fujieda, R.
78-001477
Fujihara, M. P.
78-002147
Fukunaga, M.
78-001944
Fulmer, R. F.
78-001846
Fulton, W.
78-001908
78-001915
Fusco, A. C.
78-001992
78-001993
Fustish, C. A.
78-001994
Gale, W. F.
78-002229
Gall, G. A. E.
78-001909
Gannon, B. J.
78-001569
Garcia-Tello, P.
78-002027
Gardiner, D. M.
78-001444
Gardner, D. C.
78-001759
Gardner, D. R.
78-002108
78-002109
Gardner, W. S.
78-002034
Garside, E. T.
78-001578
Garton, J. E.
78-002194
Gasaway, R. D.
78-001847
Gatto, M.
78-001792
Gavlena, F. K.
78-001694
Geckler, J. R.
78-002099
Gelroth, J. V.
78-002195
George, J. C.
78-001405
Gerking, S. D.
78-001740
Germany, R. D.
78-001726
Gewirtz, D. A.
78-001445
Ghittino, P.
78-001934
78-001943
78-001975
Ghosh, S. R.
78-001333
Gibson, D. I.
78-001995
Gibson, R. N.
78-001695
Giffin, R. D.
78-002157

Gilbreath, L.
78-001832
Gilfallan, E. S.
78-002035
Gilfillan, E. S.
78-002050
Gilliland, M. W.
78-002283
Gilmore, R. G.
78-002230
Girard, J.-P.
78-001538
Gjedrem, T.
78-001813
Glebe, B. D.
78-001741
Gliwicz, Z. M.
78-001774
Globus, A.
78-001356
Glodek, G. G.
78-001910
Glodek, G. S.
78-001646
Glubokovskii, M. K.
78-001631
Goettl, J. P., Jr.
78-002092
Goetz, F. W.
78-001446
78-001447
Gold, J. R.
78-001909
Goldberg, S. R.
78-001742
Goldstein, L.
78-001441
Gomelyuk, V. Ye.
78-001743
Goodchild, C. D.
78-002249
Goodman, J.
78-002196
Goodwin, S. L.
78-001565
Gorbunova, N. N.
78-001784
Gordon, D.
78-001935
Gordon, D. C., Jr.
78-002036
Gore, J. A.
78-002255
Gorelova, T. A.
78-001775
Gorshkov, S. V.
78-001611
Gorshkova, G. V.
78-001611
Goswami, S. V.
78-001581
Goudie, C. A.
78-001448
Grabe, S. A.
78-001776
Graham-Smith, W.
78-001362
78-001363
Grahl-Nielsen, O.
78-002037
Graig, J. F.
78-001777
Granett, J.
78-002100
Grant, C. J.
78-001364
Graser, L. F.
78-002231
Gray, R. H.
78-001761
Green, D. R.
78-002028
Greenfield, D. W.
78-001910
Greer, G. J.
78-001996
Gregoire, J.
78-001794
Gresik, J. H.
78-002232
Griffioen, W.
78-001284
Griffith, J. S.
78-001449
Grigorash, V. A.
78-001571
Gritsenko, O. F.
78-001696
Grizzle, J. M.
78-002122
Gronell, A. M.
78-002222
Gronlund, W. D.
78-001937
78-002118
Gross, H. P.
78-001365
Grossman, D. C.
78-002283
Grove, D. J.
78-001574
Grudniewski, C.
78-001323
Guderley, H.
78-001450
78-001462
Guderley, H. E.
78-001461
78-001576
Guerrero, L. A.
78-001299
Guerrero, R. D. III
78-001299
Guest, W. C.
78-001647
Guillory, V.
78-001847
Gulf Coast Research Institute
78-002278
Gulidov, M. V.
78-001451
Gulland, J. A.
78-002166
78-002179
Guma'a, S. A.
78-001778
Gunnes, K.
78-001813
Guppy, M.
78-001461
78-001462
78-001576
Gupta, P. K.
78-002138

Gupta, R. K.
78-001366
Hacking, M. A.
78-002101
Haimovici, M.
78-001819
Hall, R. A.
78-002038
Hall, T. A.
78-002283
Halligan, B. J.
78-001339
Hamdy, M. K.
78-002102
Hamid, A.
78-001452
Hampson, G. R.
78-002039
Handcock, A. J.
78-001305
78-001306
Hannafin, J. A.
78-001441
Hanson, C. H.
78-002247
Hanson, D. L.
78-001648
Hanson, S. A.
78-002050
Hara, A.
78-001453
Hardig, J.
78-001454
Hardy, R.
78-002048
Harkness, D. R.
78-001475
78-001476
Harms, U.
78-001501
Harp, G. L.
78-001846
Harrell, L. W.
78-001942
Harris, J. W.
78-001606
78-001612
Hartman, A. M.
78-002103
Hartmann, F.
78-001649
Hasegawa, E.
78-001561
Hasler, A. D.
78-001670
Hasnain, A. U.
78-001455
Haswell, M. S.
78-001513
78-001533
78-001552
78-001553
Hata, M.
78-001456
Hatch, R.
78-002100
Hattingh, J.
78-001568
Hattula, M. L.
78-002040
78-002104
Hawkes, J. W.
78-002118
Hayashi, K.
78-001457
Haynes, J. M.
78-001761
Heard, R. G.
78-001931
Heath, A. G.
78-002088
Hecht, T.
78-001697
78-001698
78-001814
Heckman, J. R.
78-001613
Heckmann, R. A.
78-001963
Hedden, W. L., Jr.
78-001458
Heffernan, P. H.
78-002190
Heidinger, R. C.
78-001294
78-002168
Heiligenberg, W. F.
78-001651
Heitman, J. F.
78-001810
Helfrich, P.
78-002197
Helle, J. H.
78-001724
Hemsworth, R. J.
78-002072
Henderson, H. F.
78-002175
78-002176
Hennessy, S. L.
78-001281
Henry, K. A.
78-001727
Hergenrader, G. L.
78-002245
Herke, W. H.
78-001817
Hermanutz, R. O.
78-002078
78-002105
Herricks, E. E.
78-002041
Hershman, M. J.
78-002198
Hilton, J. W.
78-001324
Himberg, K-J. M.
78-001610
Hinton, D. E.
78-002114
Hirai, H.
78-001453
Hirano, T.
78-001522
Hirsch, P. J.
78-001650
Hirshfield, M. F.
78-001459
Hitzel, F. N.
78-001330
Hixon, M. A.
78-001767
Ho, J.-S.
78-001997
78-001998

Hobson, E. S.
78-001779
Hochachka, P. W.
78-001434
78-001435
78-001443
78-001450
78-001460
78-001461
78-001462
78-001463
78-001471
78-001472
78-001473
78-001576
Hodges, D. H., Jr.
78-002160
Hodgins, H. O.
78-002118
Hodgson, D. W.
78-002106
Hodson, K.
78-002101
Hodson, P. V.
78-002107
Hoffman, M. J.
78-002110
Holcombe, G. W.
78-002120
Holden, C.
78-001282
Holder, D. R.
78-002233
Holeton, G. F.
78-001464
78-001572
78-001573
Holland, W. F.
78-002282
Holmes, P. D.
78-001931
Holmgren, S.
78-001465
Holt, J. K.
78-002230
Holt, R. S., Jr.
78-001300
Honda, H.
78-001491
Honn, K. V.
78-001466
Hopkins, C. D.
78-001651
Horning, W. B.
78-002099
Horowitz, A.
78-002018
Horrall, R. M.
78-001670
Horseman, N. D.
78-001467
Houston, A. H.
78-001468
Howard, C. N.
78-001936
Howell, W. M.
78-001604
Hoyt, R. D.
78-001753
Hubbs, C.
78-001840
Huckins, J. N.
78-002165
Hudson, W. F.
78-001780
Hughes, G. M.
78-001367
78-001469
78-001470
Huish, M. T.
78-001762
Hulbert, W. C.
78-001460
78-001461
78-001462
78-001463
78-001471
78-001472
78-001473
Hulet, W. H.
78-001368
Humphreys, G. B.
78-001868
Hunter, C. R.
78-001369
Huntsman, G. R.
78-002214
Hyatt, W.
78-002052
Ibara, R. M.
78-001666
Icanberry, J. W.
78-001848
Ichikawa, T.
78-001535
Idler, D. R.
78-001495
78-001581
Iga, T.
78-001474
Ikeda, S.
78-001595
78-001597
Inoue, H.
78-001815
International Pacific Halibut Commission
78-002272
Intong, S.
78-001826
Ionova, V. A.
78-001781
Isaacks, R. E.
78-001475
78-001476
78-001492
78-001493
Ishii, T.
78-001595
Ishikawa, M.
78-001491
Iversen, E. S.
78-001971
Iverson, E. M.
78-001275
Iwai, T.
78-001367
Iwamatsu, T.
78-001477
Iwamoto, T.
78-001911
Izower, J.
78-001478
Jackson, D. A.
78-002108
78-002109

Jafri, A. K.
78-001479
James, B.
78-001849
Janatuinen, J.
78-002040
Janovy, J., Jr.
78-001957
Jansen, W. F.
78-001480
Jarrell, H.
78-002194
Jarvinen, A. W.
78-002110
Jaspers, E. J.
78-001481
Jayaprakash, A. A.
78-001850
Jefferies, D. S.
78-002029
Jena, S.
78-002242
Jensen, K. W.
78-001728
Jensen, L. A.
78-001963
Jensen, S.
78-002055
Jeserich, G.
78-001388
Jo, Y.
78-001944
Johansen, K.
78-001482
78-001483
78-001513
Johnson, B. M.
78-001837
78-001851
Johnson, G. N.
78-002234
Johnson, J. E.
78-002167
Johnson, M. G.
78-002180
Johnson, W. W.
78-002125
Johnston, I.
78-001484
Johnston, I. A.
78-001470
Johnstone, R.
78-001287
Jones, A.
78-002001
Jones, B. W.
78-001617
Jones, D. C.
78-002282
Jones, G. S.
78-001852
Jones, J. W.
78-001791
Jones, N. V.
78-001809
Jones, R. S.
78-002230
Joshi, B. D.
78-001485
Juario, J. V.
78-001295
Judd, F. W.
78-001402
Kachina, T. F.
78-001486
Kah, O.
78-001487
Kakimoto, D.
78-001452
Kanazawa, R. H.
78-001927
Kanias, G. D.
78-002057
Kanid'yev, A. N.
78-001325
Kantor, E. J.
78-002106
Kar, S. L.
78-002242
Karuppaswamy, P.
78-001871
Karzinkin, G. S.
78-001488
Kassimati, E. M.
78-002057
Kausch, H.
78-001559
Kawai, K.
78-001944
78-001945
Kawanabe, H.
78-001652
Kawazu, H.
78-001557
Kayama, M.
78-001527
Kays, M.
78-002279
Kazantseva-Selezneva, A. A.
78-001370
Kazlauskene, O. P.
78-001562
Keirans, W. J., Jr.
78-001853
Keirn, M. A.
78-002033
Keizer, P. D.
78-002036
78-002042
Kelley, E.
78-002059
Kelso, J. R. M.
78-002052
Kemp, W. M.
78-002043
Kendall, A. W.
78-001699
Kendall, A. W., Jr.
78-001912
Kendall, D. R.
78-002034
Kennedy, C. R.
78-001999
Kennedy, G. J. A.
78-001729
Kensley, B. F.
78-001854
Kent, B.
78-001489
Kesavan Nair, A. K.
78-002273
Kesbeke, F.
78-001583
Kesler, D. H.
78-001816

Khakberdiyev, B.
78-001681
Khan, M. Z.
78-001855
Khan, R. A.
78-001964
Khawaja, D. K.
78-001479
Khlebovich, V. V.
78-001490
Khvoles, A. G.
78-002111
Kiceniuk, J. W.
78-002130
Kikuchi, T.
78-001491
Kilambi, R. V.
78-001700
78-001820
Kilgen, R. H.
78-001889
Kim, H. D.
78-001475
78-001476
78-001492
78-001493
Kimball, G. L.
78-002112
Kimmerer, W. J.
78-002274
Kimura, H.
78-001946
Kimura, I.
78-001455
King, D. J.
78-001887
King, M. J.
78-001439
King, P. E.
78-001317
Kingsbury, A. P.
78-002074
Kinoshita, T.
78-001614
78-001615
Kirschbaum, F.
78-001371
Kjelson, M. A.
78-002234
Klaunig, J. E.
78-002114
Klose, P.
78-002196
Knaggs, E. H.
78-001856
Knudsen, E. E.
78-001817
Koch, H. J.
78-001494
Kokh, Kh.
78-001825
Kolar, D. J.
78-002148
Kolomin, Yu. M.
78-001701
Komatsu, i.
78-001945
Komourdjian, M. P.
78-001495
Konar, S. K.
78-002075
Konchina, Yu. V.
78-001857
Kondo, N.
78-001629
Kondyurin, V. V.
78-001381
78-001919
Korn, S.
78-002096
Kornfield, I. L.
78-001616
Korobko, Yu. A.
78-002111
Kortmulder, K.
78-001770
Koskova, L. A.
78-001702
Kotake, N.
78-001944
Kotov, A. M.
78-001496
Kovalak, W. P.
78-001345
78-001346
Kovalevskaya, N. V.
78-001913
Kozlova, M. P.
78-001782
Kral, R. E.
78-001586
Kramer, D. L.
78-001497
78-001498
Krayushkina, L. S.
78-001499
Krebs, C. T.
78-002044
Kritsky, D. C.
78-002000
Krumholz, L. A.
78-001823
Krupitskiy, Yu. G.
78-001858
Krupkin, V. Z.
78-001502
Kryvi, H.
78-001372
Kulczycki, G. R.
78-002230
Kulshreshtha, S. D.
78-001373
Kumagai, H.
78-001500
Kunjipalu, K. K.
78-001818
Kunze, J.
78-001501
Kuragina, G. N.
78-001765
Kurbatov, B. V.
78-001374
Kurz, B. J.
78-001619
Kusuda, R.
78-001944
78-001945
78-001946
Kuz'min, A. N.
78-001502
Kuz'mina, V. V.
78-001503
Kuznetsov, Ye. A.
78-001783
Kwasnik, J. P. S.
78-002113

Kwei, E. A.
78-001703
Lachner, E. A.
78-001916
Lacy, J. C.
78-002282
78-002283
LaGrone, F. S.
78-002283
Lallier, F.
78-001377
Lambert, J. G. D.
78-001541
Lametschwandtner, A.
78-001387
Laming, P. R.
78-001504
Landreth, G. E.
78-001505
Landry, A. M., Jr.
78-002045
Lannan, J. E.
78-001947
Lanzing, W. J. R.
78-001506
78-001653
Lapin, V. I.
78-001507
Laptev, M. I.
78-001283
Larson, G. L.
78-001341
Larson, R. J.
78-001654
Lasswell, J. L.
78-001647
Latey, A. N.
78-001554
Laurent, P.
78-001375
Lavrova, Ye. A.
78-001508
Law, W. M.
78-001509
Lawrence, J. M.
78-001888
Lazareva, L. P.
78-001301
Lazarus, S.
78-001894
Leatherland, J. F.
78-001519
78-001564
Lech, J. J.
78-002121
78-002144
Lee, R.
78-001740
Leeth, B. D.
78-001589
Legendre, V.
78-001704
LeGrande, W.
78-001338
Leithiser, R. M.
78-001859
Lembeck, M. E.
78-002223
Lembi, C. A.
78-001275
78-001276
Lemm, C. A.
78-001330
Leonard, E. N.
78-002142
Leonard, R. L.
78-002283
Leppakoski, E. J.
78-002046
Lesiuk, T. P.
78-001376
Lessem, A. S.
78-001579
Leveille, G. A.
78-001510
Levy, E. M.
78-002021
Lewis, M. A.
78-002047
Lewis, W. M.
78-001277
78-001302
78-002168
Leybush, B. N.
78-001547
Lezina, A. N.
78-001301
Li, H.
78-001730
Li, H. W.
78-001638
78-002247
Lim, C.
78-001326
Lin, H.
78-001510
Linden, E.
78-002149
Lindquist, D. G.
78-001860
Lindsey, C. C.
78-001376
78-001497
78-001609
Lindstrom, L. S.
78-002046
Lines, I. L.
78-002262
Lipovsky, S. J.
78-001800
78-002191
Lipskaya, N. Ya.
78-001784
Lipsky, M. M.
78-002114
Liss, W. J.
78-001731
Llorca, M. N.
78-001890
Loftus, K. H.
78-002180
Logan, W. D.
78-002199
Lom, J.
78-001960
78-001961
Lopez, E.
78-001377
Lorenzen, M.
78-002200
Lott, M.
78-001970
Love, M. S.
78-001785
Lovell, R. T.
78-001326

Loyacano, H. A., Jr.
78-001304
Lu, J. D.
78-001303
Luckhurst, B. E.
78-001655
Luckhurst, K.
78-001655
Lucking, M.
78-001484
Lund, J. E.
78-001948
Lunde, G.
78-002149
Luxon, P. L.
78-002161
Luzhin, B. P.
78-001523
L'vova, T. G.
78-001490
Lwowski, E. S.
78-001511
Lykkeboe, G.
78-001483
MacDonald, S.
78-002001
MacDowell, L. G. III
78-002230
Mackie, A. M.
78-001321
78-001512
Mackie, I. M.
78-001617
Mackie, P. R.
78-002048
Madhavi, P.
78-002002
Magley, W. C.
78-002230
Magnin, F.
78-001704
Mahadevan Pillai, P. K.
78-001744
Mahnken, C.
78-001291
Makhotin, Yu. M.
78-002265
Maksimov, V. A.
78-001623
Maksimov, Yu. M.
78-002235
Malecki, E. J.
78-002283
Malins, D. C.
78-002079
78-002137
Malvestuto, S. P.
78-002003
78-002215
Malyukina, G. A.
78-001425
Malyutin, V. S.
78-001755
Mancy, K. H.
78-002115
Mangum, C. P.
78-001482
78-001483
78-001513
Manier, J.-F.
78-002008
Mann, J. B.
78-002106
Mann, K. H.
78-002049
Mann, R. H. K.
78-001769
Manooch, C. S. III
78-001819
Marais, J. F. K.
78-001803
Margrey, S. L.
78-002087
Markiw, M. E.
78-001965
Markle, D. F.
78-001914
Markofsky, J.
78-001516
Marks, L. J.
78-002064
Marks, R.
78-001414
Marquez, D. J.
78-002236
Marquez, F. D.
78-001514
Marshall, B. E.
78-001705
Marshall, J. S.
78-002116
Marshall, K. E.
78-002279
Martel, A. L. D.
78-001515
Martelly, E.
78-001540
Martin, D. B.
78-002266
Martin, D. F.
78-002253
Martin, S. B.
78-002058
Marzolf, G. R.
78-002195
Massey, L. L.
78-002201
Mastrianni, W.
78-002059
Mateo, R.
78-001295
Matias, J. R.
78-001516
Matsuo, M.
78-001596
Matsuura, F.
78-001399
78-001400
Matthews, G.
78-001517
Matthews, W. J.
78-001656
Matthey, J. K.
78-001663
Mattson, C. R.
78-001724
78-001861
Mattson, V. R.
78-002117
Matuda, K.
78-002237
Maughan, O. E.
78-002076
Mayer, F. L.
78-002163

Mayo, D. W.
78-002050
McBride, J. R.
78-001286
McCaffrey, P. M.
78-001862
McCain, B. B.
78-001937
78-002118
McCain, J. C.
78-002051
78-002119
McCall, T. C.
78-001763
McCarthy, M. M.
78-001570
McCarty, L. S.
78-001468
McCleave, J. D.
78-001679
McCord, C. L., Jr.
78-001304
McCormack, J. C.
78-001769
McDowall, R. M.
78-001915
McHugh, J. J.
78-001294
McIntosh, A. W.
78-002148
McIntyre, J. D.
78-001976
McKaye, K. R.
78-001642
McKim, J. M.
78-002120
McKinney, J. F.
78-001916
McKnight, I. J.
78-002004
McNatt, R. M.
78-002202
McQuarrie, I. G.
78-001518
Meaburn, G. M.
78-002038
Medvedeva, Ye. D.
78-001623
Mehrle, P. M.
78-002163
Meier, A. H.
78-001467
Meisch, M. V.
78-001306
Melancon, M. J., Jr.
78-002121
Menzel, B. W.
78-001618
Merkowsky, A. J.
78-001305
78-001306
Merrett, N. R.
78-001706
Merritt, R. B.
78-001619
Meunier, F.
78-001371
Meyerhoff, R. D.
78-001341
Michelsen, A.
78-001558
Middlebrooks, B. L.
78-001509
Middlebrooks, E. J.
78-001570
Mikhailichenko, L. V.
78-001986
Mikhaylin, S. V.
78-001620
Mikhman, A. S.
78-001786
Milet, C.
78-001540
Miley, W. W. II
78-001878
Millemann, R. E.
78-001994
Miller, G. D.
78-002283
Miller, M. C. III
78-002228
Miller, P. J.
78-001917
Miller, R. L.
78-001764
Millington, S. T.
78-001662
78-001663
Mills, A. L.
78-002027
Mills, L.
78-001756
Milne, R. S.
78-001519
Milton, P.
78-002093
Minns, C. K.
78-002052
78-002252
Mitchell, A. J.
78-002122
Mitchell, L. G.
78-001966
Mitzner, L.
78-001278
Miyoshi, M.
78-001378
Mizue, K.
78-001674
Moffatt, N. M.
78-001520
Mohn, L. O.
78-002076
Mohr, H. W., Jr.
78-002229
Moiseyenko, S. N.
78-001499
Mok, H.-K.
78-001787
Moller, H.
78-001938
Montgomery, J. C.
78-001761
78-001989
Montgomery, W. L.
78-001788
Moodie, G. E. E.
78-001497
Moon, T. W.
78-001463
78-001471
78-001472
78-001473
78-001521
78-001533

Morang, S.
78-002100
Morgan, E. L.
78-001824
Moriarty, C.
78-001707
Morin, J. G.
78-001391
Morisawa, M.
78-001522
Moroz, I. Ye.
78-001523
Morris, D. L.
78-002072
Morse, W. W.
78-001708
Morton, W. D.
78-001524
Moser, M.
78-002000
Mosman, N. J.
78-001730
Moss, J.
78-002029
Mosse, P. R. L.
78-001379
Moul, E. T.
78-002039
Moy, E. C.
78-002090
Muench, K. A.
78-001745
Muir, J.
78-001657
Muirhead-Thomson, R. C.
78-002123
78-002124
Mukhamedova, A. F.
78-001525
Mumphrey, A. J.
78-002203
Munro, J. L.
78-001717
Murat, J. C.
78-001526
Murawski, S. A.
78-001709
78-001710
Murphy, G. G.
78-002151
Murphy, G. I.
78-001319
Mushacke, F. M.
78-001863
Musina, N. Kh.
78-002267
Musiy, Yu. I.
78-001918
Muthu, M. S.
78-001864
Myagkov, N. A.
78-001380
78-001381
78-001919
Myers, M. S.
78-001937
78-002118
Nagel, M. L.
78-001967
Nair, C. N.
78-001359
Nakagawa, H.
78-001527
78-001528
Nakajima, K.
78-001968
Nakamura, I.
78-001865
Nakano, S.
78-001865
Nance, S.
78-001746
Narasimham, K. A.
78-001864
Natochin, Yu. V.
78-001508
Naumov, A. G.
78-001418
Nayudu, P. L.
78-001369
Nazarov, N. A.
78-001382
Needham, E. A.
78-001962
Neiheisel, T. M.
78-002099
Nekrasova, N. P.
78-001765
Nelissen, M. H. J.
78-001658
Nelson, J. S.
78-001621
78-001866
78-001920
Nelson, N. C.
78-001979
Nepszy, S. J.
78-001969
Nevins, M. J.
78-002125
Newbold, J. D.
78-002204
Newcome, W.
78-001732
Newton, S. H.
78-001305
78-001306
Nezdoliy, V. K.
78-001765
Nicholson, W. R.
78-002216
Nicol, J. A. C.
78-001398
Nicola, S. J.
78-001909
Nicolai, B.
78-001560
Nikolayev, A. S.
78-001747
Nikol'skiy, G. V.
78-002275
Nilov, V. I.
78-002126
Nixon, D. E.
78-001764
Nizovtsev, G. P.
78-001867
Noble, E. R.
78-002000
78-002005
Nordlie, F. G.
78-001529
Norman, M. D.
78-001931
Notini, M.
78-002053

Novotny, A. J.
78-001942
Oates, D.
78-002054
O'Connor, J. M.
78-001622
Odom, R. R.
78-002034
Ofsted, E. B.
78-002149
Ogambo-Ongoma, A.
78-002003
Ogino, C.
78-001327
Oguri, M.
78-001383
Ohnishi, R.
78-001395
Ojha, J.
78-001424
Olah, J.
78-001953
Olatunde, A. A.
78-001748
78-001789
O'Leary, P. J.
78-001949
Olivereau, M.
78-001487
Olmsted, L. L.
78-001820
Olson, K. R.
78-002127
Olson, R. E.
78-001939
Olsson, M.
78-002055
Omarov, M. O.
78-001301
Onoue, Y.
78-001530
Orias, J. D.
78-002005
Orimo, H.
78-001596
Orme, L. E.
78-001330
Ostrowski, A. C.
78-001663
Oswald, R. L.
78-002128
Otto, R. G.
78-001922
Ovcharov, O. P.
78-001374
Oven, L. S.
78-001531
Overstreet, R. M.
78-001993
Owen, W. B., Jr.
78-001931
Owens, E. H.
78-002056
Oxley, D. J.
78-001868
Paasivirta, J.
78-002040
Pacheco, A. L.
78-001709
Page, D. S.
78-002050
Pakhorukov, A. M.
78-001765
Panasenko, V. A.
78-001782
Pandey, B. N.
78-001424
Pandey, P. K.
78-001424
Panek, F. M.
78-001749
Papadopoulou, C.
78-002057
Papaparaskeva-Papoutsoglou, E. G.
78-001328
Paperna, I.
78-001384
Papoutsoglou, S. E.
78-001328
Paragamian, V. L.
78-001790
Paris, H.
78-001526
Parker, B. C.
78-002088
Parker, F. R., Jr.
78-001532
Parker, N. C.
78-001313
Parks, N. B.
78-002217
78-002276
Parrish, R. H.
78-001733
Parsons, T. R.
78-002085
Partridge, F. E.
78-001750
Paterson, W. B.
78-001959
Patrick, R.
78-002129
Patten, B. G.
78-002025
Patterson, D. W.
78-002262
Patton, J. S.
78-001533
Patzner, R. A.
78-001534
78-001535
Paulson, L. J.
78-001536
Pavlov, D. S.
78-001765
Pavlovic, M.
78-001548
Payan, P.
78-001537
78-001538
78-001539
Payer, R. D.
78-001734
Payne, J. F.
78-002130
Payusova, A. N.
78-001781
Pearson, W. D.
78-001678
Pease, B. C.
78-001314
Peck, J. M., Jr.
78-002051
78-002119
Pedley, R. B.
78-001791

Pehrson, R. V.
78-002169
Peignoux-Deville, J.
78-001540
Peirce, E. C. II
78-001489
Pelzman, R. J.
78-002220
Pennington, C. H.
78-001307
Penrith, M. J.
78-001854
Penrose, W. R.
78-002155
Pentreath, R. J.
78-002131
Percy, J. A.
78-002132
Percy, R. C.
78-001550
Pertseva-Ostroumova, T. A.
78-001385
Peterman, R. M.
78-001792
Peters, G.
78-002006
Peters, H. M.
78-001386
Peters, W.
78-002006
Petr, T.
78-002268
Peute, J.
78-001541
78-001582
Peyrin, L.
78-001423
Pfeiffer, W.
78-001659
Pfeiler, E.
78-001542
Pflieger, W. L.
78-001869
Philipose, V.
78-002269
Phillips, A. C.
78-001660
Phleger, C. F.
78-001427
78-001543
78-001544
Piavis, M. G.
78-001546
Pic, P.
78-001537
78-001545
Pickering, A. D.
78-001954
Pickering, Q. H.
78-002099
Pierce, R. J.
78-001711
Pietsch, T. W.
78-001793
Pigg, J.
78-001870
Pinette, W. S.
78-001285
Pirtle, R. B.
78-001735
Pitt, T. K.
78-001712
Platts, W. S.
78-001750
78-002058
Plavis, G. W.
78-001546
Plisetskaya, E. M.
78-001547
Plumb, J. A.
78-001942
78-002122
Pohla, H.
78-001387
Polenov, A. L.
78-001548
Polyakova, T. I.
78-001547
Ponomarenko, V. P.
78-001867
Poole, B. M.
78-001751
Poon, D. C.
78-001288
Popova, K. S.
78-001451
Porcella, D. B.
78-001570
Porter, M. E.
78-002205
Poston, T. M.
78-002147
Potter, I. C.
78-001549
78-001550
Potter, W. A.
78-001829
Power, G.
78-001289
78-001794
Powers, D. A.
78-001922
Powles, P. M.
78-001667
Poznanin, L. P.
78-001713
Prabhu, N. V.
78-002102
Prejs, A.
78-001774
Price, N. R.
78-002133
Primavera, J. H.
78-001295
Prince, E. D.
78-002206
Proviz, L. I.
78-001821
Prusevich, N. A.
78-002267
Qadri, S. U.
78-001901
Quinn, J. G.
78-002070
Rabanal, H. R.
78-001315
Rachlin, J. W.
78-001622
Rahmann, H.
78-001388
Raibaut, A.
78-002008
Rajagopalan, M.
78-001871

Rajbanshi, V. K.
78-002073
Raleigh, R. F.
78-002076
Ramalingam, P.
78-001864
Ramamurthy, S.
78-001316
Ramos, F.
78-001551
Randall, D. J.
78-001552
78-001553
78-001644
Randolph, K. N.
78-001329
Rangneker, P. V.
78-001554
Rao, N. G. S.
78-001333
78-002242
Rappaport, E. B.
78-002283
Rasachandra Kartha, K. N.
78-001822
Rass, T. S.
78-002275
Rau, M. E.
78-001935
78-001991
Rawdon, B. B.
78-001389
Rawstron, R. R.
78-002220
Ray, S.
78-002134
Raye, T. D.
78-002283
Redmon, W. L.
78-001823
Reed, R. J.
78-001752
Regier, H. A.
78-002180
Regunathan, A.
78-001871
Rehwinkel, B. J.
78-002256
Rehwoldt, R. E.
78-002059
Reid, R.
78-002029
Reinitz, G. L.
78-001330
Reno, P. W.
78-001977
Repetski, J. E.
78-001872
Reunanen, H.
78-002104
Reutergard, L.
78-002055
Reynolds, J. B.
78-002207
Reynolds, W. W.
78-001661
78-001662
78-001663
78-001664
78-001665
Ribeiro, A. F.
78-001628
Rice, D. W., Jr.
78-001848
Richards, F. P.
78-001666
Richards, R. H.
78-001954
Richey, D. L.
78-002135
78-002136
Riegel, J. A.
78-001555
Riegelbauer G.
78-001659
Rigley, L.
78-001657
Riley, D. M.
78-002007
Riley, R. G.
78-002080
Rimmer, D. M.
78-001289
Ritenour, B. G.
78-001275
78-001276
Robadue, D.
78-002209
Roberts, R. J.
78-001414
Robinette, J. R.
78-001824
Robinson, D. G.
78-002241
Robinson, D. W.
78-002181
Robinson, E. L.
78-002099
Robinson, J.
78-002159
Robison, H. W.
78-001873
Robison, W. R.
78-001700
Roesijadi, G.
78-002060
Rogers, J. F.
78-001619
Rogers, R. M., Jr.
78-001795
Rohovec, J. S.
78-001942
Roland, W.
78-001796
Romanenko, V. D.
78-001308
Romsos, D. R.
78-001510
Ronsivalli, L. J.
78-001714
Rose, C. R.
78-002240
Roseboom, D. P.
78-002135
78-002136
Ross, J.
78-001667
Ross, M. R.
78-001752
Ross, S. T.
78-001797
Rottmann, R. W.
78-001768
78-001799
Roubal, W. T.
78-002137

Roussel, J. D.
78-001481
Rousset, V.
78-002008
Rout, M.
78-001333
Rowland, W. J.
78-001668
78-001669
Rowlands, R. D.
78-001668
Rozhdestvenskaya, A. D.
78-001283
Rozing, W.
78-001585
Rubtsov, V. V.
78-001309
78-001390
Ruby, E. G.
78-001391
Runey, M. W.
78-002011
Rush, S. B.
78-001556
Russo, J. L.
78-001903
Russo, R. C.
78-002150
Ryan, J. H.
78-002219
Ryzhov, V. M.
78-001874
Saiki, K.
78-001500
Sainsbury, M.
78-001683
Sakai, T.
78-001557
Sakamoto, S.
78-001331
78-001332
Sakata, T.
78-001452
Samson, R.
78-001295
Samuelson, D. F.
78-001342
Sand, O.
78-001558
Sanders, H. L
78-002061
Sannamiya, N.
78-002237
Sarkka, J.
78-002040
Sarokon, J. A.
78-001590
Sasaki, T.
78-001830
Sastry, K. V.
78-002138
Sato, M.
78-001597
Saunders, B. S.
78-001544
Sauskan, V. I.
78-001874
Savage, G. E.
78-001504
Savvaitova, K. A.
78-001623
Savvatimskiy, P. I.
78-001825
Sawyer, E. S.
78-001950
Scalet, C. G.
78-001734
78-001835
Schade, R.
78-001559
Scheider, W. A.
78-002029
Schleuter, R. A.
78-001852
Schlisio, W.
78-001560
Schneider, J. C.
78-002254
Schoen, T. M.
78-001392
Scholz, A. T.
78-001670
Schramm, H. L., Jr.
78-001302
78-001798
Schreiner, K. M.
78-002170
Schultz, R. J.
78-001632
Schultz, S. A.
78-001843
Schultz, T. W.
78-002139
Schuytema, G. S.
78-001279
Scoppettone, G. G.
78-001875
Sears, H. S.
78-001724
Seegert, G. L.
78-002140
Seigel, J. A.
78-001921
Seki, N.
78-001561
78-001566
Seleznev, V. V.
78-002267
Sen, P. R.
78-001333
78-002242
Sergiyenko, V. A.
78-001918
Serobaba, I. I.
78-001624
Sersland, H. N.
78-002171
Sethness, E. D.
78-002282
Settles, W. H.
78-001753
Setzler, E. M.
78-001715
Shackley, S. E.
78-001317
sharma, M. S.
78-001428
Shaw, E.
78-001671
Shcherbina, M. A.
78-001562
Shcherbina, T. V.
78-001562
Shekhanova, I. A.
78-002126

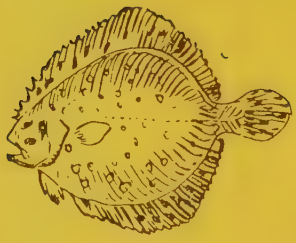
Shelton, W. L.
78-001563
78-002215
Shen, A. C. Y.
78-001564
Sherman, W. R.
78-001565
Shetty, H. P. C.
78-001334
Shevelev, M. S.
78-001867
Shimizu, C.
78-001399
78-001400
Shimomura, M.
78-001566
Shireman, J. V.
78-001768
78-001799
Shirgur, G. A.
78-002164
Shirkova, A. P.
78-001625
Shomura, R. S.
78-002238
Shrode, J. B.
78-001740
Shul'man, G. Ye.
78-001594
Shum, G.
78-002098
Shute, J. R.
78-001860
Shute, P. W.
78-001860
Shuttleworth, T. J.
78-001567
Sibunka, J. D.
78-001766
Sidell, B. D.
78-001922
Sil'chenko, G. P.
78-001754
Simenstad, C. A.
78-001800
Simpson, P. C.
78-001565
Simpson, T. H.
78-001287
Sinclair, T. P.
78-001978
Singh, S. P.
78-001393
Sinley, J. R.
78-002092
Sinoda, M.
78-001826
Sivak, J. G.
78-001394
Sklyarov, V. Ya.
78-001325
Sliger, W. A.
78-001849
Slinger, S. J.
78-001324
Sloterdijk, H. H.
78-001876
Smirnova, Zh. V.
78-001432
Smit, G. L.
78-001568
Smith, A. C.
78-001551
Smith, C. A.
78-001979
Smith, C. E.
78-002150
Smith, D. A.
78-002172
Smith, D. G.
78-001569
Smith, G. E.
78-002221
Smith, J. J.
78-001875
78-001877
Smith, L. L., Jr.
78-002112
Smith, M. W.
78-001626
Smith, W. G.
78-001716
78-001766
Snyder, W.
78-002029
Sohn, J. J.
78-001641
Soin, S. G.
78-001318
Sokolov, L. I.
78-001755
Soldwedel, R. H.
78-002225
Solmie, A.
78-001284
Sorensen, D. L.
78-001570
Sorenson, E.
78-002050
Southward, A. J.
78-002062
Southward, E. C.
78-002062
Sozinov, I. A.
78-001290
Spain, A. V.
78-001364
Spanovskaya, V. D.
78-001571
Spataru, P.
78-001801
Spehar, R. L.
78-002141
78-002142
Spieler, R. E.
78-001645
Spinelli, J.
78-001291
Spotila, J. R.
78-001411
Spry, D. J.
78-002107
Squibb, K. S.
78-002127
Squire, J. L., Jr.
78-002280
Squires, W. R.
78-002130
St. Amant, J. A.
78-002226
Stainken, D. M.
78-002143
Stall, J.
78-002059
Stalling, D. L.
78-002165

Stanley, J. G.
78-001878
78-002173
Stansby, M. E.
78-002063
Statham, C. M.
78-002144
Stauffer, T. M.
78-001672
Staveland, J. T.
78-002037
Stegeman, J. J.
78-002145
Stein, D. L.
78-001923
Stein, R. A.
78-001802
Stepanova, V. D.
78-001283
Stephan, C. E.
78-002099
Stephens, J. A.
78-002034
Stevens, D. E.
78-002208
Stevens, D. G.
78-002146
Stevens, E. D.
78-001464
78-001497
78-001572
78-001573
Stevenson, S. V.
78-001574
Stewart, J. E.
78-002064
Stich, H. F.
78-002006
Stokes, B. E.
78-001337
Stolbov, A. Ya.
78-001575
Stone, R. A.
78-002157
Storey, K. B.
78-001461
78-001462
78-001576
Stranahan, S. I.
78-002137
Strand, J. A.
78-002147
Strange, C. D.
78-001729
Strange, R. J.
78-001577
Strout, R. G.
78-001950
Struhsaker, J. W.
78-001319
Stuart, J. D.
78-002283
Stuart, T. J.
78-002065
Studenetskiy, S. A.
78-002275
Sudhakara Rao, G.
78-001864
Sullivan, J. F.
78-002148
Sullivan, J. R.
78-002009
Summerfelt, R. C.
78-001967
78-002194
Sundararaj, B. I.
78-001581
Suter, P. J.
78-001347
Sutton, D. L.
78-001878
Svanberg, O.
78-002149
Svardson, G.
78-001610
Swanson, G. A.
78-001348
Sweeney, W. D.
78-002174
Symons, P. E. K.
78-001673
Syuzyumova, L. M.
78-001986
Szyjka, S. P.
78-002144
Tack, P. I.
78-001510
Takagi, T.
78-001457
Takahashi, E.-I.
78-001629
Takahashi, H.
78-001311
78-001312
Takahashi, T.
78-001627
Takemura, A.
78-001674
Taki, Y.
78-001629
Takita, T.
78-001674
Tal, S.
78-001310
Tandon, R. S.
78-001485
Tapiador, D. D.
78-002175
Tarter, D. C.
78-001812
Tay, K.-L.
78-001578
Taylor, R. L.
78-001970
Taylor, T. L.
78-001879
Teal, J. M.
78-002066
Tebbit, G. L.
78-001942
Teleki, G.
78-001841
Tereshchenko, M. I.
78-001308
Terrell, C.
78-002188
78-002189
Thatcher, T.
78-002017
Theis, G. L.
78-001340
Thomas, M. L. H.
78-002067
Thomas, M. M.
78-002010

Thompson, B. A.
78-001924
Thompson, R.
78-001717
Thornton, K. W.
78-001579
Thorslund, T. W.
78-002110
Thresher, R. E.
78-001675
78-002222
Thurston, R. V.
78-002150
Tikhomirov, O. B.
78-001580
Tippie, V.
78-002209
Toetz, D.
78-002194
Toews, D.
78-002083
Toledo F., S. A.
78-001628
Tomanovich, L. V.
78-001786
Tomasso, J. R., Jr.
78-002151
Tormosova, I. D.
78-001320
Totland, G. K.
78-001372
Towle, D. W.
78-001513
Toyoshima, M.
78-001830
Traxler, G. S.
78-001974
Treacy, D. H.
78-001349
Trivedi, Y.
78-001676
Truscott, B.
78-001581
Tryapitsyna, L. N.
78-001725
Tsuji, S.
78-001371
Tsutsui, H.
78-002175
Tubb, R. A.
78-002152
Tucker, C. S.
78-002153
Turner, S. C.
78-001693
U.S. Environmental Protection Agency
78-002068
78-002210
Ueck, M.
78-001395
Ueda, H.
78-001311
78-001312
Ultsch, G. R.
78-002154
Umminger, B. L.
78-001556
Urchinov, D.
78-001681
Urushido, T.
78-001629
Ustyugov, A. F.
78-001858
Uthe, J. F.
78-002098
Utter, F.
78-001630
Uwate, K. R.
78-001925
Vaas, K. F.
78-001585
Vail, K. F.
78-001677
Vallee, J. A.
78-001842
van den Avyle, M. J.
78-002243
van den Hurk, R.
78-001582
van den Thillart, G.
78-001583
van der Gaag, M. A.
78-001541
van der Heiden, J. T.
78-001705
van der Schalie, W. H.
78-002069
van der Westhuizen, H. C.
78-001803
van Dort, J. B.
78-001480
van Oijen, M. J. P.
78-001896
Van Vleet, E. S.
78-002070
van Well, P.
78-001811
Vandermeulen, J. H.
78-002035
78-002042
78-002118
78-002155
Vari, R. P.
78-001926
Varland, K. L.
78-002185
Vasil'kov, V. P.
78-001827
Venables, B. J.
78-001678
Venkataraman, G.
78-001880
Venkatesh, B.
78-001334
Verigina, I. A.
78-001396
Vermeij, J. A. J.
78-001582
Vesel'skiy, S. P.
78-001308
Vigliani, E.
78-001934
Viktorovskii, R. M.
78-001631
Vinogradov, G. A.
78-001490
Vinyard, G. L.
78-001804
Virnstein, R. W.
78-001805
Vislie, T.
78-001584
Vlasblom, A. G.
78-001585

Vodicnik, M. J.
78-001586
Vodovskaya, V. V.
78-001881
Volobuyev, V. V.
78-001718
Voss, E. W., Jr.
78-001587
Vreeland, R. R.
78-002227
Vrijenhoek, R. C.
78-001632
Vyshegorodtsev, A. A.
78-001719
Wahle, R. J.
78-002227
Waiwood, K. G.
78-002156
Wakamatsu, Y.
78-001588
Wake, K.
78-001395
Walbridge, C. T.
78-002117
Walker, J. D.
78-002027
Wannamaker, A. W.
78-002011
Ward, R. W.
78-002157
Warner, K.
78-002263
Warrick, J. W.
78-001848
Watabe, N.
78-001589
Waxman, H. M.
78-001679
Weber, R. E.
78-001482
Webster, G. F.
78-001991
Wedemeyer, G. A.
78-001979
78-002158
Weiss, R. E.
78-001589
Weitkamp, D. E.
78-002012
Weitzman, S. H.
78-001927
Welcomme, R. L.
78-002176
Welhelmsen, S.
78-002037
Wellings, S. R.
78-001937
Wells, A.
78-001716
78-001766
Wells, A. W.
78-001882
Werner, A. E.
78-002159
Wharton, J. H.
78-001509
Wheeler, A.
78-001633
White, I. L.
78-002283
White, J. R.
78-002247
Whitmore, D. H., Jr.
78-002160
Whittle, K. J.
78-002048
Whyte, J. N. C.
78-002277
Wickelgren, W. O.
78-001517
Wijeyaratne, M. J. S.
78-001770
Wilhm, J.
78-002194
Wilk, S. J.
78-001720
Williams, D.
78-001849
Williams, D. D.
78-002013
78-002014
Williams, T. D.
78-001361
Williams, W. D.
78-001347
Willis, D. E.
78-002077
Willoughby, L. G.
78-001955
Wilson, A. J.
78-002071
Wilson, M. L.
78-002283
Wilson, M. V. H.
78-001928
Windell, J. T.
78-001590
Windom, H. L.
78-002034
Wing, B. L.
78-001861
Winick, R. D.
78-002090
Winningham, J. R.
78-001599
78-001983
Winstanley, R. H.
78-002239
Wiseman, E. D.
78-001634
Witte, F.
78-001896
Witte-Maas, E. L. M.
78-001896
Wold, D.
78-001971
Wolf, K.
78-001965
Wolters, W. R.
78-001415
78-001591
Wong, C. S.
78-002028
Wong, P. T. S.
78-002161
Wood, C. M.
78-001417
Wootten, P.
78-002015
Wootton, R. J.
78-001756
Wright, G. M.
78-001549
78-001592

Wright, M. I.
78-001593
Wyatt, L. E.
78-001951
Wydoski, R. S.
78-002177
Yakovleva, K. K.
78-001594
Yamamoto, Y.
78-001595
Yamanaka, H.
78-001491
Yamauchi, H.
78-001596
Yan, N. D.
78-002029
Yaremenko, V. V.
78-001883
Yasui, T.
78-001455
Yasutake, W. T.
78-002158
Yefremenko, V. N.
78-001397
Yel'tsova, V. N.
78-001891
Yernst, P.
78-001825
Yevsin, V. N.
78-001635
78-001636
Yevtushenko, N. Yu.
78-001308
Yone, Y.
78-001331
78-001332
Yonemori, T.
78-001680
Yopp, J. H.
78-001302
Yoshida, A.
78-001596
Yoshinaka, R.
78-001597
Yoshiyama, R. M.
78-001892
Youngson, A. F.
78-001287
Youson, J. H.
78-001549
78-001550
78-001592
Zahner, E. J.
78-001637
Zambriborshch, F. S.
78-002162
Zar, J. H.
78-002094
Zarick, P. P.
78-001952
Zavala-Camin, L. A.
78-001903
Zeissig, J. E.
78-001598
Zelinskiy, Yu. P.
78-001721
Zeman, M. E.
78-001599
Zidek, J.
78-001929
Zinn, J.
78-002188
78-002211
Ziv, I.
78-001310
Zohar, Y.
78-001430
Zolotnitskiy, A. P.
78-001600
Zook, E. G.
78-002038
Zorbidi, Zh. Kh.
78-001806
Zorn, M.
78-001801
Zubchenko, I. Z.
78-001601
Zubova, S. E.
78-001602
Zver'kova, L. N.
78-001757
Zyznar, E. S.
78-001398



Aegean Sea
78-002057
Africa
78-001516
Africa: Kariba Dam
78-002264
Africa: Lake Tanganyika
78-001811
Africa: Lake Victoria
78-001896
Alabama
78-001888
78-001889
Alambama: Tombigbee River
78-001604
Alaska
78-001724
78-001861
78-002074
78-002198
78-002210
Alaska: Bristol Bay
78-001732
Alaska: Prince William Sound
78-001735
Amazon Basin
78-001427
78-001435
78-001443
78-001497
78-001513
78-001544
American Samoa
78-002197
Arabian Sea
78-001850
78-001918
Arctic Area
78-002018
Arizona: Canyon Lake
78-002202
Arizona: Cholla Lake
78-001763
Arizona: Pinto Creek
78-002047
Arkansas
78-001306
78-001873
78-001884
Arkansas: Beaver Reservoir
78-001931
Arkansas: Buffalo River
78-001700
Arkansas: Crowley's Ridge
78-001846
Arkansas: Eleven Point River
78-001851
Arkansas: Lake Fort Smith
78-001820
Arkansas: Randolph Cty.
78-001837
Arkansas: Stone Cty.: Sylamore Creek
78-001844
Atlantic Ocean
78-001738
78-001819
78-001833
78-001865
78-002005
78-002271
Atlantic Ocean, Eastern
78-001919
Atlantic Ocean: Florida
78-001971
Atlantic Ocean: New York
78-001766
78-001863
Atlantic Ocean, North
78-001683
78-001706
78-001712
78-001825
78-001950
78-001995
78-001997
78-002046
78-002048
78-002062
Atlantic Ocean, North: Celtic Sea
78-001382
Atlantic Ocean, North: Norwegian Sea
78-001867
Atlantic Ocean, South
78-001684
78-001697
78-001698
78-001803
Atlantic Ocean, Western
78-001903
Australia
78-001905
Australia: Tasmania
78-001908
Australia: Victoria
78-002239
Australia: Victoria: Acheron River
78-001347
Australia: Victoria: Murray River
78-001838
Australia: Victoria: Snobs Creek
78-001344
Belize
78-001990
Bering Sea
78-001624
78-001937
Bolivia
78-001926
California
78-001654
78-001745
78-001856
78-001899
78-001963
78-002000
78-002016
78-002204
78-002262
California: Anaheim Bay
78-001859
California: Castle Lake
78-001536
California: Clear Lake
78-001730
California: Deer Creek
78-001638
California: Lake Cty.: Clear Lake Basin
78-001879
California: Merle Collins Reservoir
78-002220

California: Orange Cty.
78-001987
California: Pacific Ocean
78-001785
78-001843
California: Pajaro River
78-001877
California: Plumas Cty.: Frenchman Reservoir
78-002219
California: Sacramento-San Joaquin Estuary
78-002208
78-002221
California: San Diego Cty.
78-002223
California: Santa Monica Bay
78-001842
California: Williamson Lakes
78-001909
Canada: Alberta
78-001834
Canada: Alberta: North Milk River
78-001882
Canada: British Columbia
78-001796
78-001928
78-002028
Canada: British Columbia: Great Central Lake
78-002241
Canada: British Columbia: Strait of Georgia
78-001660
78-002277
Canada: British Columbia: Williston Reservoir
78-001621
Canada: Northwest Territories: Char Lake
78-001982
Canada: Nova Scotia: Chedabucto Bay
78-002035
78-002036
78-002042
78-002064
78-002067
Canada: Nova Scotia: Miramichi River
78-002134
Canada: Ontario
78-002029
78-002180
78-002224
Canada: Ontario: Algonquin Park
78-001959
Canada: Ontario: Nith River
78-001868
Canada: Quebec
78-001289
78-001704
78-001991
Canada: Quebec: Lower Seal Lake
78-001794
Canada: Quebec: Schefferville
78-001935
Canada: Quebec: St. Lawrence River
78-001876
Canada: Yukon Territory
78-001605
Caribbean Area
78-001717
Caribbean Sea
78-001902
Caspian Sea
78-001429
78-001881
Chesapeake Bay
78-001805
Chile: Straits of Magellan
78-002027
Columbia River
78-001761
78-002012
78-002191
78-002227
Ecuador
78-001646
England
78-001633
78-001809
78-001988
England: Cornwall
78-002062
England: Cow Green Reservoir
78-002183
England: Severn Estuary
78-001683
78-001759
England: Upper Teesdale: Cow Green
78-001769
England: Windermere
78-001777
78-001778
78-001955
Finland
78-002040
78-002046
Florida
78-001764
78-001768
78-002007
Florida: Crystal River
78-002043
Florida: Escambia Bay
78-002071
Florida: Lake Apopka
78-002033
Florida: Tampa Bay
78-001797
Georgia
78-001626
78-001936
78-002233
Georgia: Brunswick
78-002034
Georgia: Doboy Sound
78-001715
Ghana
78-001703
Gulf of Aden
78-001918
Gulf of Mexico
78-001795
78-001862
78-001993
78-002201
78-002203
78-002216
Gulf of Mexico: Campeche Bank
78-001874
Gulf of Thailand
78-001826
Hawaii
78-001319
78-002274

Hawaii: Honolulu
78-002051
Idaho
78-001648
78-002169
Idaho: Blackfoot River
78-002058
Idaho: South Fork Salmon River
78-001750
Illinois
78-001277
India
78-001316
78-001850
78-002075
78-002164
India: Lake Pichhola
78-002073
India: River Cauvery
78-002010
Indian Ocean
78-001676
78-001689
78-001744
78-001787
78-001818
78-001822
78-001855
78-001864
78-001871
78-001880
78-001894
78-001906
78-001916
78-001981
78-002269
78-002273
Indian Ocean: Bay of Bengal
78-001980
Indiana
78-001275
Indiana: Sullivan Cty.
78-001852
Iowa
78-001966
78-002014
78-002185
Iowa: Big Creek Lake
78-001790
Iowa: Lake LaVerne
78-002260
Iowa: Red Haw Lake
78-001278
Israel
78-001310
Israel: Lake Kinneret
78-001801
Italy
78-001943
Italy: Ligurian Sea
78-002024
Jamaica
78-001739
Japan
78-001614
78-001615
78-001627
78-001674
78-001968
Kansas
78-001900
Kansas: Greenwood Cty.: Hamilton Quarry
78-001929
Kansas: Pottawatomie Cty.: Lost Creek
78-002195
Kentucky: Meade Cty.: Doe Run
78-001823
Kentucky: Warren Cty.: Ivy Creek
78-001753
Kenya: Lake Naivasha
78-002003
Lake Erie
78-001841
78-001969
Lake Erie: Nanticoke
78-002052
Lake Huron
78-002254
Lake Huron: Douglas Point
78-002052
Lake Michigan
78-001670
Lake Superior
78-001808
Louisiana
78-001773
78-001817
Maine: Penobscot River Estuary
78-001760
Maine: Piscataquis Cty.: Big Bennett Pond
78-002263
Maine: Searsport
78-002050
Marshall Islands
78-001779
Massachusetts
78-002026
Massachusetts: Buzzards Bay
78-002039
78-002061
78-002066
Massachusetts: Mill River
78-001752
Mediterranean
78-002022
Mediterranean Area
78-002024
78-002032
Mediterranean Area: Aegean Sea
78-002057
Mexico: Baja California: Pacific Ocean
78-001843
Michigan
78-002259
Michigan: Otsego Cty.: Club Stream
78-001345
Michigan: Pigeon River
78-001346
Minnesota: Cannon River
78-001690
Mississippi: Tombigbee River
78-001604
Missouri
78-001869
Missouri River
78-002207
Montana: Madison River
78-002266
Montana: Tongue River
78-002255
Montana: Yellowstone River
78-002256
Nebraska
78-002054

Nebraska.....continued
78-002246
Netherlands
78-001585
Netherlands Antilles
78-001655
Nevada: Goshute Creek
78-002199
New Jersey: Round Valley Reservoir
78-002225
New Jersey: Stone Harbor
78-001853
New York
78-001863
New York: Atlantic Ocean
78-001766
New York: Hudson River
78-001622
78-001776
78-002059
New Zealand
78-001827
78-001866
78-001920
Nigeria: Lake Kainji
78-001748
78-001789
North America
78-001897
78-002244
North Carolina
78-001860
78-002214
North Carolina: Cape Fear River
78-001762
North Carolina: Lake Norman
78-001984
North Sea
78-002131
Northern Ireland
78-001729
Norway
78-001813
78-001999
Norway: Lake Ovre Heimadalsvatn
78-001728
Ohio
78-002258
Ohio: Acton Lake
78-001711
Ohio: Little Auglaize River
78-002205
Ohio: Olentangy River
78-002192
Oklahoma
78-002194
Oklahoma: Mill Creek
78-001836
Oklahoma: Muddy Boggy River
78-001870
Oregon
78-001342
78-001831
78-002198
Oregon: Corvallis
78-001292
Oregon: Pacific Ocean
78-001923
78-001939
Pacific Ocean
78-001688
78-001733
78-001745
78-001767

Pacific Ocean.....continued
78-001775
78-001779
78-001784
78-001787
78-001830
78-001893
78-001906
78-001911
78-001916
78-002020
78-002217
78-002272
78-002276
78-002280
Pacific Ocean: Bering Sea
78-001624
78-001937
Pacific Ocean: California
78-001785
Pacific Ocean: California: Diablo Canyon
78-001848
Pacific Ocean: Canada
78-001796
Pacific Ocean: Japan
78-001627
Pacific Ocean: Oregon
78-001923
78-001939
Pacific Ocean: Sea of Japan
78-001757
Pacific Ocean, Southeastern
78-001998
Pennsylvania: Northampton Cty.: Bushkill Creek
78-001343
Pennsylvania: Susquehanna River
78-001932
Pennsylvania: Venango Cty.: Little Scrubgrass Creek
78-002041
Peru
78-001910
Philippines
78-001299
78-001315
78-001807
78-001890
78-002236
Philippines: Laguna de Bay
78-002270
Poland
78-001774
Rhode Island
78-001816
Rhode Island: Narragansett Bay
78-002070
Rhodesia: Lake McIlwaine
78-001705
Salvelinus namaycush - Habitat Selection
78-001672
Scotland
78-001695
78-002015
South Africa
78-001684
78-001697
78-001698
78-001803
South America
78-001927

South Carolina
78-001304
78-002214
South Carolina: Charleston
78-002228
South Carolina: Lake Robinson
78-001749
South Dakota: Little Missouri River
78-001835
South Dakota: Pickering Slough
78-001734
South West Africa: Sandvis
78-001854
Sri Lanka
78-001770
Suez Canal
78-001758
78-001917
Surinam
78-001651
Sweden: Gastviken
78-002053
Sweden: Lake Roxen
78-002055
Tanzania
78-001658
Tennessee
78-001810
Tennessee: Burgess Falls Lake
78-001780
Tennessee: Great Smoky Mountains Natl. Park
78-001824
Tennessee: Obion Cty.: Indian Creek
78-001849
Tennessee: Putram Cty.: Blackburn Fork
78-001983
Texas
78-001300
78-001313
Texas: Balmorhea State Recreation Area
78-001840
Texas: Comal Cty.: Canyon Reservoir
78-002193
Texas: Galveston Bay
78-002045
Texas: North Lake
78-002065
Texas: Postoak Lake
78-002243
Texas: Trinidad Lake
78-001307
78-001726
United Arab Republic
78-001941
United States
78-001847
78-001878
78-002173
United States: Atlantic Coast
78-002196
United States, Northeastern
78-001950
78-002209
United States, Southeastern
78-002009
United States, Southern
78-001819
78-001839
United States, Western
78-002283
USSR
78-001283
78-001318
78-001486
78-001507
78-001635
78-001737
78-001781
USSR: Courland Lagoon
78-001782
USSR: Dagestan
78-001301
USSR: Irtysh-Karaganda Canal
78-001828
USSR: Kamchatka Bay
78-001747
USSR: Kapchagay Reservoir
78-002267
USSR: Khorezm Province
78-001681
USSR: Krasnoyarsk Territory
78-001858
USSR: Kuban River
78-001765
USSR: Kuybyshev Reservoir
78-001754
78-002265
USSR: Kuyto Lakes
78-001721
USSR: Lake Azabach'ye
78-001611
78-001806
USSR: Lake Baikal
78-001891
USSR: Lake Frolikha
78-001623
USSR: Lake Ladoga
78-001625
USSR: Lake Pskov-Chudskoye
78-001725
USSR: Lake Uyeginskoye
78-001718
USSR: Lena River
78-001755
USSR: Mozhaysk Reservoir
78-001571
USSR: Nadym River
78-001701
USSR: Sakhalin
78-001696
78-001883
USSR: Saratov Reservoir
78-001702
USSR: Sea of Azov
78-001786
USSR: Shchugor River
78-001886
USSR: Syr Darya
78-001682
USSR: Tyumen
78-001290
USSR: Volga River
78-001765
USSR: Volgograd Reservoir
78-001694
USSR: White Sea
78-001736
USSR: White Sea Basin
78-001636
USSR: Yuribey River
78-001719
Venezuela
78-001692

Virginia: Clinch River

78-002076
Virginia: Holiday Creek
78-001829
Virginia: Smith Mountain Lake
78-002206
Wales
78-001756
78-001958
Wales: Llyn Dwythwch
78-001791
Wales: River Wye
78-002072
Washington
78-002025
78-002198
Washington: Columbia River
78-001761
Washington: Henderson Inlet
78-001314
Washington: Lake Washington
78-001722
78-001723
78-001771
Washington: Snake River
78-001832
West Germany
78-002030
West Virginia: Ohio River
78-001812
West Virginia: Wayne Cty.: East
Lynn Lake
78-001746
Wisconsin
78-001670
78-001687
78-002261
Wyoming
78-001687
Wyoming: Green River
78-002218

Abramis brama - Embryology
78-001451
Abramis brama - Foods/Feeding
78-001782
Abramis brama - Management/Research/Lakes
78-001725
Abramis brama - Oxygen
78-001451
Abramis brama - Population Studies
78-001725
Abudefduf saxatilis - Distribution/Geographical
78-001863
Abudefduf sexfasciatus - Taxonomy
78-001893
Acanthodes - Paleontology
78-001929
Acerina cernua - Foods/Feeding
78-001782
Acerina cernua - Henneguya
78-001960
Acerina cernua - Induced Maturation
78-001433
Acerina cernua - Life History/General
78-001701
Acerina cernua - Myxosporida
78-001960
Acerina cernua - Parasites/Diseases
78-001960
Acerina cernua - Protozoan Diseases
78-001960
Acipenser baeri - Population Studies
78-001755
Acipenser baeri - Spawning
78-001755
Acipenser guldenstadti - Endocrinology
78-001548
Acipenser oxyrhynchus - Distribution/Geographical
78-001876
Acipenser oxyrhynchus - Life History/General
78-001709
Acipenser ruthenus - Endocrinology
78-001602
Acipenser ruthenus - Radiation
78-001602
Acipenser stellatus - Body Form
78-001374
Acipenser stellatus - Embryology
78-001419
Acipenser transmontanus - Movements
78-001761
Acipenseridae - Osmoregulation
78-001499
Aequidens latifrons - Nervous System
78-001478
Alestes imberi - Life History/General
78-001705
Alosa fallax - Age/Growth
78-001759
Alosa fallax - Movements
78-001759
Alosa pseudoharengus - Chlorine
78-002140
Alosa pseudoharengus - Identification
78-001904
Alosa sapidissima - Bioenergetics
78-001741
Alosa sapidissima - Commercial Fishing
78-002217
Alosa sapidissima - Management/Research/Marine
78-002217
Alosa sapidissima - Restoration of Anadromous Runs
78-001741
Alosa sapidissima - Spawning Migration
78-001741
Ambassis interrupta - Metabolic Rates
78-001529
Ambassis interrupta - Salinity
78-001529
Ambloplites rupestris - Age/Growth
78-001823
Ambloplites rupestris - Condition Factors
78-001823
Ambloplites rupestris - Maturation
78-001823
Amia calva - Temperature
78-001662
Amia calva - Temperature Selection
78-001662
Amphiprion percula - Integument
78-001369
Amphiprion polymnus - Anemones
78-001676
Anabantidae - Air Breathing
78-001386
Anatolepis - Paleontology
78-001872
Anguilla anguilla - Culture/Propagation
78-001297
Anguilla anguilla - Feeding Experiments
78-001297
Anguilla anguilla - Hormones
78-001540
Anguilla anguilla - Skeletal System
78-001377
Anguilla japonica - Bacterial Diseases
78-001945
Anguilla japonica - Endocrinology
78-001596
Anguilla japonica - Osmoregulation
78-001522
Anguilla japonica - Parasites/Diseases
78-001945
Anguilla japonica - Streptococcus
78-001945
Anguilla rostrata - Corpuscles of Stannius
78-001511
Anguillidae - Life History/General
78-001707
Anguilliformes - Electric Organs
78-001445
Anoplarchus insignis - Distribution/Geographical
78-001831
Antipodocottus galatheae - Distribution/Geographical
78-001866

Antipodocottus galatheae - Taxonomy
78-001866
Aplocheilus melastigma - Allocreadium fasciatusi
78-002002
Aplocheilus melastigma - Parasites/Diseases
78-002002
Aplocheilus melastigma - Trematodes
78-002002
Apogonichthys ellioti - Opisthomonorcheides indicus
78-001980
Apogonichthys ellioti - Parasites/Diseases
78-001980
Apogonichthys ellioti - Trematodes
78-001980
Apogonidae - Activity Patterns
78-001655
Arapaima - Air Breathing
78-001461
78-001462
78-001473
Arapaima - Enzymes
78-001461
78-001462
Arapaima gigas - Air Breathing
78-001406
78-001431
78-001434
78-001443
78-001450
78-001463
78-001482
78-001543
78-001553
78-001573
78-001644
Arapaima gigas - Blood Chemistry
78-001406
78-001482
78-001493
Arapaima gigas - Cardio-Vascular System
78-001431
Arapaima gigas - Enzymes
78-001434
78-001450
78-001576
Arapaima gigas - Excretory System
78-001463
78-001576
Arapaima gigas - Gills
78-001543
Arapaima gigas - Lactate Dehydrogenase
78-001443
Arapaima gigas - Metabolism
78-001492
Arapaima gigas - Respiration
78-001434
78-001443
78-001463
78-001482
78-001543
78-001553
78-001573
78-001644
Arapaima - Gills
78-001473
Arapaima - Respiration.
78-001461
78-001462
78-001473
Archosargus probatocephalus - Cell Culture
78-001509
Argyrosomus argentatus - Sound Production
78-001674
Ariosoma balearicum - Early Development
78-001368
Ariosoma balearicum - Morphology
78-001368
Aristichthys nobilis - Age/Growth
78-001301
Aristichthys nobilis - Culture/Propagation
78-001301
Aristichthys nobilis - Foods/Feeding
78-001301
Arius spixii - Age/Growth
78-001691
Arius spixii - Length-Weight Relationships
78-001691
Arius spixii - Spawning
78-001691
Aspius aspius iblioides - Condition Factors
78-001682
Aspius aspius iblioides - Fecundity
78-001682
Aspius aspius iblioides - Spawning
78-001682
Astroconger myriaster - Heavy Metals
78-001491
Astroconger myriaster - Mercury
78-001491
Auchenipteridae - New Species
78-001910
Bagarius bagarius - Acoustico-Lateralis System
78-001366
Barbus meridionalis - Diplozoon homoion gracile
78-002001
Barbus meridionalis - Parasites/Diseases
78-002001
Bathygobius soporator - Vision
78-001436
Belontiidae - Air Breathing
78-001386
Betta splendens - Aggressive Behavior
78-001649
78-001677
Betta splendens - Spawning
78-001649
Blennius pholis - Anesthetics
78-002093
Blennius pholis - Culture/Propagation
78-001317
Blennius pholis - Incubators
78-001317
Blennius pholis - Jar Culture
78-001317
Blennius pholis - Quinaldine
78-002093

Bothriolepis - Acoustico-Lateralis System
78-001362
Brachydanio rerio - Enzymes
78-001426
Brachydanio rerio - Excretory System
78-001541
Brachydanio rerio - Meristic Studies
78-001609
Brachydanio rerio - Temperature
78-001609
Brachydanio rerio - Variation Studies
78-001609
Brevoortia patronus - Age/Length Composition
78-002216
Brevoortia patronus - Commercial Fishing
78-002216
Brevoortia patronus - Harvest
78-002216
Brevoortia patronus - Management/Research/Marine
78-002216
Bryozoichthys lysimus - Distribution/Geographical
78-001830
Bryozoichthys majorius - Distribution/Geographical
78-001830
Callogobius clitellus - New Species
78-001916
Callogobius hastatus - New Species
78-001916
Campostoma anomalum - Hybridization
78-001618
Campostoma - Electrophoresis
78-001607
Campostoma - Variation Studies
78-001607
Caranx hippos - Foods/Feeding
78-001703
Caranx hippos - Spawning
78-001703
Carassius auratus - Activity Patterns
78-001663
Carassius auratus - Anoxia
78-001583
Carassius auratus - Antibiotics
78-001524
Carassius auratus - Coloration
78-001401
Carassius auratus - Culture/Propagation
78-001312
Carassius auratus - Endocrinology
78-001586
Carassius auratus - Enzymes
78-001401
Carassius auratus - Growth Stimulants
78-001312
Carassius auratus - Herbicides
78-002104
Carassius auratus - Hormones
78-001586
Carassius auratus - Induced Maturation
78-001312
Carassius auratus - Integument
78-001369
Carassius auratus - MCPA
78-002104
Carassius auratus - Metabolism
78-001484
Carassius auratus - Osmoregulation
78-001422
Carassius auratus - Parasites/Diseases
78-001967
Carassius auratus - pH
78-002154
Carassius auratus - Pleistophora ovariae
78-001967
Carassius auratus - Protozoan Diseases
78-001967
Carassius auratus - Stress
78-001556
Carassius auratus - Temperature
78-001484
78-001524
78-001663
Carassius auratus - Vision
78-001358
78-001458
78-001505
78-001518
78-001598
Carassius gibelio langsdorfi - Pineal Organ
78-001395
Carcharhinus obscurus - Movements
78-001762
Carcharinidae - Healing
78-001410
Caspialosa kessleri - Abundance/Factors of
78-001881
Caspialosa kessleri - Distribution/Factors of
78-001881
Catla catla - Culture/Propagation
78-002242
Catla catla - Fertilization/Soil and Water
78-002242
Catla catla - Polyculture
78-002242
Catla catla - Pond Culture
78-002242
Catostomus commersoni - Copper
78-002120
Catostomus commersoni - Heavy Metals
78-002120
Catostomus commersoni - Hybridization
78-001621
Catostomus commersoni - Temperature
78-001661
Catostomus commersoni - Temperature Selection
78-001661
Catostomus macrocheilus - Biacetabulum oregoni
78-002013
Catostomus macrocheilus - Cestodes
78-002013

Catostomus macrocheilus - Gas Bubble Disease
78-001989
Catostomus macrocheilus - Hybridization
78-001621
Catostomus macrocheilus - Parasites/Diseases
78-001989
78-002013
Catostomus occidentalis - Habitat Selection
78-001638
Cebidichthys violaceus - Distribution/Geographical
78-001831
Centrarchidae - Cryptogonimidae
78-001996
Centrarchidae - Parasites/Diseases
78-001996
Centrarchidae - Trematodes
78-001996
Centropristis striata - Life History/General
78-001699
Chaetodipterus faber - Spawning
78-001738
Chalcalburnus chalcoides - Blood Chemistry
78-001429
Chalcalburnus chalcoides - Electrophoresis
78-001429
Channa punctatus - Diazinon
78-002081
Channa punctatus - Dimethoate
78-002081
Channa punctatus - Heavy Metals
78-002138
Channa punctatus - Insecticides
78-002081
Channa punctatus - Lead
78-002138
Channa punctatus - Lead Nitrate
78-002138
Channa punctatus - Organophosphates
78-002081
Channa punctatus - Parathion
78-002081
Channa punctatus - Taste Reception
78-001373
Chanos chanos - Abundance/Factors of
78-001890
Chanos chanos - Culture/Propagation
78-001295
Chanos chanos - Early Development
78-001295
Chanos chanos - Fertilization
78-001295
Cheilodactylus macropterus - Age/Growth
78-001827
Cheilopogon - Identification/Larvae
78-001913
Chelon engeli - Filming Amine
78-002119
Chelon engeli - Morpholine
78-002119
Chelon engeli - Power Plant Effluents
78-002119
Chimaera monstrosa - Locomotion
78-001372
Chimaera monstrosa - Musculature
78-001372
Chimaera monstrosa - Organ Weights
78-001383
Chirocentrus dorab - Neohystero indica
78-001980
Chirocentrus dorab - Neohystero lecitha
78-001980
Chirocentrus dorab - Parasites/Diseases
78-001980
Chirocentrus dorab - Trematodes
78-001980
Chondrichthyes - Life History/General
78-001714
Chrosomus erythrogaster - Fecundity
78-001753
Chrosomus erythrogaster - Spawning
78-001753
Chrysophrys major - Feeding Experiments
78-001331
78-001332
Chrysophrys major - Heavy Metals
78-001332
78-001491
78-001500
Chrysophrys major - Iron
78-001332
Chrysophrys major - Mercury
78-001491
78-001500
Chrysophrys major - Nutrient Requirements
78-001331
78-001332
Chrysophrys major - Phosphorus
78-001331
Cichlasoma - Brooding Behavior
78-001641
Cichlasoma cyanoguttatum - Blood Chemistry
78-001402
Cichlidae - Communication
78-001658
Cichlidae - Kayotypes
78-001637
Cichlidae - Morphology
78-001896
Cichlidae - Sound Production
78-001658
Cichlidae - Speciation
78-001616
Cichlidae - Taxonomy
78-001896
Ciliata mustela - Foods/Feeding
78-001683
Ciliata mustela - Heavy Metals
78-001683
Ciliata mustela - Life History/General
78-001683
Ciliata mustela - Mercury
78-001683
Cirrhinus mrigala - Culture/Propagation
78-002242
Cirrhinus mrigala - Fertilization/Soil and Water
78-002242

Cirrhinus mrigala - Polyculture
78-002242
Cirrhinus mrigala - Pond Culture
78-002242
Clarias batrachus - Blood Chemistry
78-001485
Clupea harengus pallasi - Benzene
78-002095
78-002096
Clupea harengus pallasi - Commercial Fishing
78-002277
Clupea harengus pallasi - Hydrocarbons
78-002095
Clupea harengus pallasi - Maturation
78-001486
Clupea harengus pallasi - Oil
78-002096
78-002095
Clupea harengus pallasi - Variation Studies
78-001627
Coelorinchus aconcagua - New Species
78-001911
Coelorinchus - Distribution/Geographical
78-001911
Coelorinchus - Taxonomy
78-001911
Coregonus albula sardinella - Life History/General
78-001719
Coregonus albula sardinella - Spawning
78-001719
Coregonus artedii - Copper
78-002120
Coregonus artedii - Heavy Metals
78-002120
Coregonus autumnalis migratorius - Abundance/Factors of
78-001891
Coregonus autumnalis migratorius - Mortality Factors
78-001891
Coregonus autumnalis migratorius - Predator/Prey Relationships
78-001891
Coregonus autumnalis migratorius - Stocking/Introductions
78-001891
Coregonus clupeaformis - Electrophoresis
78-001605
Coregonus clupeaformis - Evolution
78-001605
Coregonus clupeaformis - Variation Studies
78-001605
Coregonus - Electrophoresis
78-001610
Coregonus - Hybridization
78-001625
Coregonus muksun - Culture/Propagation
78-001290
Coregonus muksun - Foods/Feeding
78-001290
Coregonus muksun - Lake Culture
78-001290
Coregonus muksun - Maturation
78-001502
Coregonus muksun - Reproductive System
78-001502
Coregonus pollan - Electrophoresis
78-001610
Coregonus pollan - Taxonomy
78-001610
Coregonus sardinella vessicus - Life History/General
78-001702
Coregonus - Taxonomy
78-001610
Coryphaenoides rupestris - Age/Growth
78-001825
Cottus cognatus - Distribution/Geographical
78-001882
Cottus gobio - Flow Regimes
78-001769
Cottus gobio - Foods/Feeding
78-001769
Cottus gobio - Impoundment
78-001769
Cottus rhotheus - Gas Bubble Disease
78-001989
Cottus rhotheus - Parasites/Diseases
78-001989
Crossopterygia - Acoustico-Lateralis System
78-001363
Ctenopharyngodon idella - Age/Growth
78-001334
Ctenopharyngodon idella - Aquatic Plant Control
78-001275
78-001276
78-001277
78-001278
Ctenopharyngodon idella - Competition
78-001884
78-001889
Ctenopharyngodon idella - Competiton
78-001888
Ctenopharyngodon idella - Culture/Propagation
78-002240
78-002242
Ctenopharyngodon idella - Distribution/Geographical
78-001847
78-001869
Ctenopharyngodon idella - Electrophoresis
78-001630
Ctenopharyngodon idella - Feeding Experiments
78-001334
Ctenopharyngodon idella - Fertilization/Soil and Water
78-002242
Ctenopharyngodon idella - Foods/Feeding
78-001334
78-001773

Ctenopharyngodon idella - Foods/Feeding/Selectivity
78-001768
Ctenopharyngodon idella - Management/Research/General
78-002168
Ctenopharyngodon idella - Management/Research/Lakes
78-001884
Ctenopharyngodon idella - Management/Research/Ponds
78-001277
78-001888
78-001889
Ctenopharyngodon idella - Movements
78-001764
Ctenopharyngodon idella - Parasites/Diseases
78-002007
Ctenopharyngodon idella - Pentastomida
78-002007
Ctenopharyngodon idella - Polyculture
78-002240
78-002242
Ctenopharyngodon idella - Pond culture
78-002242
Ctenopharyngodon idella - Predator/Prey Relationships
78-001773
78-001799
Ctenopharyngodon idella - Sebekia oxycephala
78-002007
Ctenopharyngodon idella - Spawning
78-001878
Ctenopharyngodon idella - Status
78-002173
Ctenopharyngodon idella - Strontium
78-002126
Ctenopharyngodon idella - Trophic Relationships
78-001773
Ctenopharyngodon idella - Variation Studies
78-001630
Cymatogaster aggregata - Sperm
78-001444
Cynoscion nebulosus - Early Development
78-001361
Cynoscion nebulosus - Embryology
78-001361
Cyprinodon bovinus - Status
78-001840
Cyprinodon elegans - Status
78-001840
Cyprinodon nevadensis nevadensis - Reproduction
78-001740
Cyprinodon nevadensis nevadensis - Temperature
78-001740
Cyprinus carpio - Alimentary Tract
78-001713
Cyprinus carpio - Biochemical Composition
78-001566
Cyprinus carpio - Blood Chemistry
78-001527
78-001557
78-001568
Cyprinus carpio - Carotenoids
78-001456
Cyprinus carpio - Coloration
78-001456
Cyprinus carpio - Competition
78-001888
Cyprinus carpio - Copper
78-001595
Cyprinus carpio - Culture/Propagation
78-001308
78-001309
78-001323
78-001327
78-001333
Cyprinus carpio - Digestion Rates
78-001559
Cyprinus carpio - Digestive System
78-001562
Cyprinus carpio - Early Development
78-001523
Cyprinus carpio - Embryology
78-001390
78-001523
Cyprinus carpio - Endocrinology
78-001526
Cyprinus carpio - Enzymes
78-001409
78-001562
78-001566
Cyprinus carpio - Feeding Experiments
78-001323
78-001327
78-001333
78-001559
Cyprinus carpio - Feeds
78-001327
Cyprinus carpio - Growth Stimulants
78-001308
Cyprinus carpio - Heavy Metals
78-001595
Cyprinus carpio - Incubation
78-001309
Cyprinus carpio - Management/Research/Lakes
78-001730
Cyprinus carpio - Management/Research/Ponds
78-001888
Cyprinus carpio - Metabolism
78-001523
Cyprinus carpio - Nutrition
78-001333
Cyprinus carpio - PAS-G
78-001309
Cyprinus carpio - Population Studies
78-001730
Cyprinus carpio - Starvation
78-001526
Cyprinus carpio - Stress
78-001568
Cyprinus carpio - Tannin
78-001309
Cyprinus carpio - Taste Reception
78-001373
Cyprinus carpio - Temperature
78-001409
Damalichthys saratogensis - New Species
78-001899

Damalichthys saratogensis - Paleontology
78-001899
Damalichthys vacca - Allencotyla pricei
78-002000
Damalichthys vacca - Parasites/Diseases
78-002000
Damalichthys vacca - Trematodes
78-002000
Dascyllus albisella - Filming Amine
78-002119
Dascyllus albisella - Morpholine
78-002119
Dascyllus albisella - Power Plant Effluents
78-002119
Diapterus rhombeus - Age/Growth
78-001692
Diapterus rhombeus - Length-Weight Relationships
78-001692
Diapterus rhombeus - Spawning
78-001692
Dicentrarchus labrax - Reproductive System
78-001355
Diceratiidae - New Species
78-001925
Dipnoi - Paleontology
78-001900
Dorosoma cepedianum - Bioenergetics
78-001711
Dorosoma cepedianum - Identification
78-001904
Dorosoma cepedianum - Life History/General
78-001711
Dorosoma cepedianum - Metabolic Rates
78-001711
Dorosoma cepedianum - Population Studies
78-001711
Dorosoma petenense - Reproductive System
78-001563
Dorosoma petenense - Temperature
78-001449
Drepane punctata - Fecundity
78-001744
Drepane punctata - Spawning
78-001744
Eigenmannia virescens - Electric Organs
78-001371
Elachocharax geryi - New Species
78-001927
Elachocharax - Taxonomy
78-001927
Electrophorus electrocus - Blood Chemistry
78-001493
Electrophorus electrocus - Metabolism
78-001492
Endemichthys - Taxonomy
78-001901
Engraulidae - Life History/General
78-001715
Engraulidae - Movements
78-001715
Engraulis encrasicholus maeoticus - Foods/Feeding
78-001786
Engraulis encrasicholus maeoticus - Movements
78-001737
Engraulis encrasicholus maeoticus - Spawning Migration
78-001737
Engraulis japonica - Variation Studies
78-001614
78-001615
Entosphenus japonicus - Excretory System
78-001378
Eptatretus burgeri - Endocrinology
78-001535
Eptatretus burgeri - Reproduction
78-001534
Eptatretus burgeri - Reproductive System
78-001535
Eptatretus stouti - Excretory System
78-001555
Erythrinus erythrinus - Air Breathing
78-001543
78-001572
Erythrinus erythrinus - Gills
78-001543
Erythrinus erythrinus - Respiration
78-001543
78-001572
Esox lucius - Copper
78-002120
Esox lucius - Heavy Metals
78-002120
Esox lucius - Henneguya
78-001960
Esox lucius - Myxosporida
78-001960
Esox lucius - Parasites/Diseases
78-001960
Esox lucius - Protozoan Diseases
78-001960
Esox masquinongy - Bibliographies
78-002249
Esox masquinongy - Temperature
78-001411
Esox masquinongy X E. lucius - Temperature
78-001411
Etheostoma spectabile - Electrophoresis
78-001634
Etheostoma - Taxomony
78-001897
Etheostoma zonale zonale - Life History/General
78-001690
Etmopterus lucifer - Life History/General
78-001381
Etmopterus lucifer - Morphology
78-001381
Eupomacentrus leucostictus - Territorial Behavior
78-001643
Eupomacentrus planifrons - Aggressive Behavior
78-001675

Eupomacentrus planifrons - Territorial Behavior
78-001675
Eutropius niloticus - Foods/Feeding/Selectivity
78-001789
Fistularia petimba - Foods/Feeding
78-001688
Fistularia petimba - Morphology
78-001688
Fistularia petimba - Spawning
78-001688
Fugu vermiculare porphyreum - Lipid Composition
78-001457
Fugu vermiculare porphyreum - Lipid Metabolism
78-001457
Fugu vermiculare porphyreum - Starvation
78-001457
Fundulus grandis - Foods/Feeding/Selectivity
78-001772
Fundulus grandis - Hormones
78-001467
Fundulus grandis - Insecticides
78-001772
Fundulus grandis - Osmoregulation
78-001467
Fundulus grandis - Parathion
78-001772
Fundulus grandis - Predator/Prey Relationships
78-001772
Fundulus heteroclitus - Embryology
78-001404
Fundulus heteroclitus - Oil
78-002145
Fundulus heteroclitus - Osmoregulation
78-001545
78-001578
Fundulus heteroclitus - Salinity
78-001578
Fundulus notatus - Karyotypes
78-001604
Gadidae - Nematodes
78-002015
Gadidae - Parasites/Diseases
78-002015
Gadus callarias - Osmoregulation
78-001437
78-001438
Gadus macrocephalus - Parasites/Diseases
78-001937
Gadus macrocephalus - Tumors
78-001937
Gadus morhua - Cardio-Vascular System
78-001465
Gadus morhua - Nervous System
78-001465
Galaxias tanycephalus - New Species
78-001908
Gambusia affinis - Culture/Propagation
78-001306
Gambusia affinis - Electrophoresis
78-001626
Gambusia affinis - Embryology
78-001392
Gambusia affinis - Filming Amine
78-002119
Gambusia affinis - Morpholine
78-002119
Gambusia affinis - Nervous System
78-001392
Gambusia affinis - Pesticides
78-002160
Gambusia affinis - Polyculture
78-001306
Gambusia affinis - Power Plant Effluents
78-002119
Gambusia affinis - Variation Studies
78-001626
Gambusia - Nervous System
78-001487
Gambusia nobilis - Status
78-001840
Gasterosteus aculeatus - Coloration
78-001354
Gasterosteus aculeatus - Fin Rays
78-001365
Gasterosteus aculeatus - Glugea anomala
78-001961
Gasterosteus aculeatus - Myxosporida
78-001961
Gasterosteus aculeatus - Parasites/Diseases
78-001961
Gasterosteus aculeatus - Pigments
78-001354
Gasterosteus aculeatus - Predator/Prey Relationships
78-001365
Gasterosteus aculeatus - Protozoan Diseases
78-001961
Gasterosteus aculeatus - Spawning
78-001743
78-001756
Gerres macracanthus - Distribution/Geographical
78-001880
Ginglymostoma cirratum - Endocrinology
78-001466
Ginglymostoma cirratum - Osmoregulation
78-001466
Ginglymostoma cirratum - Temperature
78-001466
Gobiidae - Age/Growth
78-001807
Gobius melanostomus - Hexachlorane
78-002162
Gobius melanostomus - Insecticides
78-002162
Gobius ocheticus - Taxonomy
78-001917
Gymnocorymbus ternetzi - Fright Behavior
78-001659
Gymnocranius griseus - Life History/General
78-001689
Gymnoscopelus - Early Development
78-001385

Gymnoscopelus - Identificaiton/Larvae 78-001385
Gymnotidae - Electric Organs 78-001651
Gymnotidae - Electrical Communication 78-001651
Harpodon nehereus - Harvest 78-002273
Helogeneidae - New Species 78-001646
Helogenes unidorsalis - New Species 78-001646
Helostomatidae - Air Breathing 78-001386
Hemichromis bimaculatus - Coloration 78-001668
Hemichromis bimaculatus - Communication 78-001668 78-001669
Hemichromis bimaculatus - Nervous System 78-001356
Hemichromis bimaculatus - Sound Production 78-001669
Hemihaplochromis philander - Endocrinology 78-001389
Heterodontus francisci - Endocrinology 78-001466
Heterodontus francisci - Osmoregulation 78-001466
Heterodontus francisci - Temperature 78-001466
Heteropneustes fossilis - Air Breathing 78-001424
Heteropneustes fossilis - Endocrinology 78-001581
Heteropneustes fossilis - Steroids 78-001581
Heteropneustes fossilis - Taste Reception 78-001373
Hiodon alosoides - Vision 78-001398
Hiodon tergisus - Vision 78-001398
Hippichthys - Distribution/Geographical 78-001906
Hippichthys - Taxonomy 78-001906
Hippoglossoides platessoides - Life History/General 78-001712
Hippoglossoides platessoides - Management/Research/Marine 78-001712
Hippoglossus stenolepis - Life History/General 78-002272
Hippoglossus stenolepis - Management/Research/Marine 78-002272
Holocentridae - Activity Patterns 78-001655
Hoplerythrinus - Air Breathing 78-001471
Hoplerythrinus - Gills 78-001471
Hoplerythrinus - Osmoregulation 78-001472
Hoplerythrinus - Respiration 78-001471
Hoplerythrinus unitaeniatus - Air Breathing 78-001417 78-001427 78-001431 78-001435 78-001443 78-001498 78-001543 78-001552 78-001569 78-001572 78-001644
Hoplerythrinus unitaeniatus - Blood Chemistry 78-001552
Hoplerythrinus unitaeniatus - Cardio-Vascular System 78-001431
Hoplerythrinus unitaeniatus - Enzymes 78-001435
Hoplerythrinus unitaeniatus - Gills 78-001543
Hoplerythrinus unitaeniatus - Lactate Dehydrogenase 78-001443
Hoplerythrinus unitaeniatus - Osmoregulation 78-001417
Hoplerythrinus unitaeniatus - Respiration 78-001427 78-001435 78-001443 78-001498 78-001543 78-001552 78-001569 78-001572 78-001644
Hoplerythrinus unitaeniatus - Swimbladder 78-001498
Hoplias - Gills 78-001471
Hoplias malabaricus - Air Breathing 78-001427 78-001435 78-001443 78-001543
Hoplias malabaricus - Enzymes 78-001435
Hoplias malabaricus - Gills 78-001543
Hoplias malabaricus - Lactate Dehydrogenase 78-001443
Hoplias malabaricus - Lipid Metabolism 78-001533

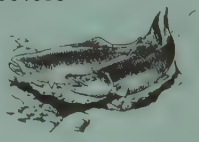
Hoplias malabaricus - Osmoregulation
78-001417
Hoplias malabaricus - Respiration
78-001427
78-001435
78-001443
78-001543
Hoplias - Osmoregulation
78-001472
Hoplias - Respiration
78-001471
Hybognathus hankinsoni - Distribution/Geographical
78-001834
Hydrolagus colliei - Organ Weights
78-001383
Hypophthalmichthys molitrix - Culture/Propagation
78-001298
Hypophthalmichthys molitrix - Polyculture
78-001298
Hypophthalmichthys molitrix - Pond Culture
78-001298
Hypophthalmicthys molitrix - Foods/Feeding
78-001783
Hypophthalmicthys molitrix - Metabolic Rates
78-001525
Ictalurus natalis - Activity Patterns
78-001665
Ictalurus natalis - Temperature Selection
78-001665
Ictalurus nebulosus - Activity Patterns
78-001657
Ictalurus nebulosus - Helminths
78-001991
Ictalurus nebulosus - Parasites/Diseases
78-001991
Ictalurus nebulosus - Temperature Selection
78-001666
Ictalurus nebulosus - Thermal Pollution
78-001666
Ictalurus platycephalus - Cleidodiscus pricei
78-001984
Ictalurus platycephalus - Parasites/Diseases
78-001984
Ictalurus platycephalus - Trematodes
78-001984
Ictalurus punctatus - Aeromonas hydrophila liquefaciens
78-001952
Ictalurus punctatus - Age/Growth
78-001812
Ictalurus punctatus - Ammonia
78-002135
Ictalurus punctatus - Bacterial Diseases
78-001952
Ictalurus punctatus - Bacterial Flora
78-001951
Ictalurus punctatus - Biofiltration
78-001302
Ictalurus punctatus - Cage Culture
78-001307
Ictalurus punctatus - Chinese Waterchestnuts
78-001304
Ictalurus punctatus - Chlorine
78-002135
78-002136
Ictalurus punctatus - Competition
78-001889
Ictalurus punctatus - Copper Sulfate
78-002153
Ictalurus punctatus - Culture/Propagation
78-001298
78-001302
78-001303
78-001304
78-001305
78-001307
78-001322
78-001326
78-001329
Ictalurus punctatus - Diets
78-001326
Ictalurus punctatus - Feeding Experiments
78-001322
78-001326
78-001329
Ictalurus punctatus - Furanace
78-002122
Ictalurus punctatus - Heated Water
78-001307
Ictalurus punctatus - Henneguya exilis
78-001956
78-001957
Ictalurus punctatus - Herbicides
78-002153
Ictalurus punctatus - Hydraulic Fluids
78-002125
Ictalurus punctatus - Hydroponics
78-001302
Ictalurus punctatus - Invertebrate Collection/Ponds
78-001305
Ictalurus punctatus - Malate Dehydrogenase
78-001593
Ictalurus punctatus - Management/Research/Ponds
78-001305
78-001889
Ictalurus punctatus - Movements
78-001763
Ictalurus punctatus - Myxosporida
78-001956
Ictalurus punctatus - Nutrient Removal
78-001304
Ictalurus punctatus - Olfaction
78-001640
Ictalurus punctatus - Osmoregulation
78-001448
Ictalurus punctatus - Parasites/Diseases
78-001952
78-001956
78-001957

Ictalurus punctatus - pH
78-002154
Ictalurus punctatus - Phosphate Esters
78-002125
Ictalurus punctatus - Piscicides
78-002163
Ictalurus punctatus - Polychlorinated Biphenyls
78-002114
Ictalurus punctatus - Polyculture
78-001298
Ictalurus punctatus - Pond Culture
78-001298
78-001304
Ictalurus punctatus - Protozoan Diseases
78-001956
78-001957
Ictalurus punctatus - Radionuclides
78-002023
Ictalurus punctatus - Recirculating Systems
78-001302
78-001303
Ictalurus punctatus - Reproductive System
78-001481
Ictalurus punctatus - Salinity
78-001448
Ictalurus punctatus - Simazine
78-002153
Ictalurus punctatus - Taste Reception
78-001640
Ictalurus punctatus - Temperature
78-001593
Ictalurus punctatus - Toxaphene
78-002163
Ictiobus niger - Alimentary Tract
78-001396
Istiophoridae - Foods/Feeding
78-001784
Jordanella floridae - Cadmium
78-002141
78-002142
Jordanella floridae - Diazinon
78-002078
Jordanella floridae - Endrin
78-002105
Jordanella floridae - Heavy Metals
78-002141
78-002142
Jordanella floridae - Insecticides
78-002078
78-002105
Jordanella floridae - Malathion
78-002105
Jordanella floridae - Zinc
78-002141
78-002142
Katsuwonus pelamis - Baits/Baiting
78-002238
Katsuwonus pelamis - Enzymes
78-001399
78-001400
Labeo calbasu - Metabolic Rates
78-001428
Labeo calbasu - Oxygen
78-001428
Labeo rohita - Culture/Propagation
78-002242
Labeo rohita - Fertilization/Soil and Water
78-002242
Labeo rohita - Polyculture
78-002242
Labeo rohita - Pond Culture
78-002242
Lactarius lactarius - Age/Growth
78-001818
78-001822
Leiostomus xanthurus - Predator/Prey Relationships
78-001805
Lepidopsetta bilineata - Parasites/diseases
78-001937
Lepidopsetta bilineata - Tumors
78-001937
Lepidopus caudatus - Taxonomy
78-001620
Lepidopus caudatus - Variation Studies
78-001620
Lepidosiren paradoxa - Air Breathing
78-001407
78-001460
Lepidosiren paradoxa - Blood Chemistry
78-001407
78-001475
78-001493
Lepidosiren paradoxa - Metabolism
78-001492
Lepidosiren paradoxa - Respiration
78-001460
Lepomis - Age/Growth
78-001823
Lepomis - Condition Factors
78-001823
Lepomis cyanellus - Distribution/Geographical
78-001868
Lepomis gulosus - Fecundity
78-001749
Lepomis macrochirus - Aeration
78-002258
Lepomis macrochirus - Age/Growth
78-001591
78-001810
Lepomis macrochirus - Ammonia
78-002135
Lepomis macrochirus - Biological Monitoring
78-002069
Lepomis macrochirus - Chlorine
78-002135
78-002136
Lepomis macrochirus - Competition
78-001888
Lepomis macrochirus - Cyanide
78-002112
Lepomis macrochirus - Diazinon
78-002078
Lepomis macrochirus - DNA
78-001599
Lepomis macrochirus - Fecundity
78-001749
Lepomis macrochirus - Fish Control/Removal
78-002259

Lepomis macrochirus - Foods/Feeding
78-001780
Lepomis macrochirus - Foods/Feeding/Selectivity
78-001804
Lepomis macrochirus - Hydraulic Fluids
78-002125
Lepomis macrochirus - Hydrogen Cyanide
78-002112
Lepomis macrochirus - Insecticides
78-002078
78-002082
Lepomis macrochirus - Length-Weight Relationships
78-001816
Lepomis macrochirus - Management/Research/Ponds
78-001888
78-002258
78-002259
Lepomis macrochirus - Organ Weights
78-001415
Lepomis macrochirus - Parathion
78-002082
Lepomis macrochirus - pH
78-002154
Lepomis macrochirus - Phosphate Esters
78-002125
Lepomis macrochirus - Piscicides
78-002082
Lepomis macrochirus - RNA
78-001599
Lepomis macrochirus - Temperature
78-001591
Lepomis macrochirus - Toxaphene
78-002082
Lepomis - Maturation
78-001823
Lepomis microlophus - Blood Chemistry
78-001402
Leptagoniates pi - New Species
78-001926
Leptagoniates - Taxonomy
78-001926
Leptonotus caretta - Taxonomy
78-001905
Lesuerigobius friesii - Life History/General
78-001695
Leuciscus cephalus - Cardio-Vascular System
78-001504
Leuciscus cephalus - Hybridization
78-001633
Leuresthes sardina - Spawning
78-001745
Leuresthes sardina - Temperature
78-001520
Leuresthes tenuis - Temperature
78-001520
Limanda aspera - Lymphocystis
78-001937
Limanda aspera - Parasites/Diseases
78-001937
Limanda aspera - Viral Diseases
78-001937
Limanda ferruginea - Distribution/Vertical
78-001766
Limanda ferruginea - Movements
78-001766
Liparidae - Distribution/Geographical
78-001923
Liparidae - Taxonomy
78-001923
Liza aurata - Culture/Propagation
78-001336
Liza aurata - Salinity
78-001336
Lophiidae - Taxonomy
78-001898
Lopholatilus chamaeleonticeps - Life History/General
78-001693
Lucania goodei - Distribution/Geographical
78-001860
Lucioperca lucioperca - Blood Chemistry
78-001429
Lucioperca lucioperca - Electrophoresis
78-001429
Lutjanus - Indentification/Larvae
78-001918
Macrouridae - Bioluminiscence
78-001391
Macrouridae - Early Development
78-001706
Macrouridae - Life History/General
78-001706
Mallotus villosus - Spawning
78-001736
Melanogrammus aegelfinus - Culture/Propagation
78-001320
Melanogrammus aegelfinus - Embryology
78-001320
Melanogrammus aegelfinus - Incubation
78-001320
Menidia menidia - Culture/Propagation
78-001751
Menidia menidia - Spawning
78-001751
Merluccius - Electrophoresis
78-001617
Merluccius productus - Enzymes
78-001530
Merluccius productus - Reproductive System
78-001442
Merluccius - Taxonomy
78-001617
Microgadus tomcod - Foods/Feeding
78-001776
Microperca - Taxonomy
78-001897
Micropogon undulatus - Age/Growth
78-001817
Micropogon undulatus - Movements
78-001817
Micropogonias undulatus - Nematodes
78-001992
Micropogonias undulatus - Parasites/Diseases
78-001992
Micropogonias undulatus - Spriocamallanus cricotus
78-001992

Micropterus - Age/Growth
78-001823
Micropterus - Condition Factors
78-001823
Micropterus dolomieui - Copper
78-002120
Micropterus dolomieui - Heavy Metals
78-002120
Micropterus dolomieui - Parasites/Diseases
78-001931
Micropterus dolomieui - Predator/Prey Relationships
78-001802
Micropterus - Maturation
78-001823
Micropterus - Parasites/Diseases
78-002009
Micropterus punctulatus - Age/Growth
78-001820
Micropterus punctulatus - Parasites/Diseases
78-001931
Micropterus salmoides - Age/Growth
78-001700
Micropterus salmoides - Ammonia
78-002135
Micropterus salmoides - Cadmium
78-002113
78-002148
Micropterus salmoides - Chlorine
78-002135
Micropterus salmoides - Competition
78-001888
Micropterus salmoides - Fecundity
78-001700
Micropterus salmoides floridanus - Stocking/Introductions
78-002223
Micropterus salmoides - Foods/Feeding
78-001700
78-001790
78-001798
78-001799
Micropterus salmoides - Heavy Metals
78-002113
78-002148
Micropterus salmoides - Management/Research/Ponds
78-001888
Micropterus salmoides - Marking/Tagging
78-002220
Micropterus salmoides - Nematodes
78-002011
Micropterus salmoides - Parasites/Diseases
78-001931
78-002011
Micropterus salmoides - Philometroides
78-002011
Micropterus salmoides - Predator/Prey Relationships
78-001799
78-002113
78-002148
Micropterus salmoides - Temperature Selection
Micropterus - Trematodes
78-002009
Microspathodon dorsalis - Foods/Feeding
78-001788
Microstomus pacificus - Sewage Effluents
78-002016
Misgurnus anguillicaudatus - Culture/Propagation
78-001311
Misgurnus anguillicaudatus - Induced Maturation
78-001311
Misgurnus fossilis - Dimethyl Sulfate
78-002111
Mola mola - Distribution/Geographical
78-001855
Morone americana - Identification/Larvae
78-001922
Morone saxatilis - Abundance/Factors of
78-001887
Morone saxatilis - Commercial Fishing
78-002276
Morone saxatilis - Competition
78-001889
Morone saxatilis - Culture/Propagation
78-001292
78-001293
78-001294
Morone saxatilis - Early Development
78-001887
Morone saxatilis - Identification/Larvae
78-001922
Morone saxatilis - Karyotypes
78-001622
Morone saxatilis - Life History/General
78-001716
Morone saxatilis - Management/Research/Ponds
78-001889
Morone saxatilis - Marking/Tagging
78-002221
Morone saxatilis - Mortality Factors
78-001294
78-001887
Morone saxatilis - Recirculating Systems
78-001293
Morone saxatilis - Stress
78-001294
Morone saxatilis - Water Diversions
78-002208
Mugil capito - Osmoregulation
78-001545
Mugil cephalus - Alimentary Tract/Bacterial Flora
78-001452
Mugil cephalus - Metabolic Rates
78-001532
Mugil cephalus - Respiration

Mugil cephalus.....continued
78-001532
Mugil cephalus - Schooling Behavior
78-001532
Mugil cephalus - Starvation
78-001551
Mugil chelo - Culture/Propagation
78-001336
Mugil chelo - Salinity
78-001336
Mugilidae - Body Form
78-001364
Mycteroperca microlepis - Age/Growth
78-001819
Mycteroperca microlepis - Age/Length Composition
78-001819
Myctophidae - Foods/Feeding
78-001775
Mylocheilus caurinus - Bioenergetics
78-001722
Mylocheilus caurinus - Mortality Rates
78-001722
Mylocheilus caurinus - Population Studies
78-001722
Mylopharodon conocephalus - Habitat Selection
78-001638
Myxine glutinosa - Gills
78-001387
Nemipterus delagoae - Distribution/Geographical
78-001871
Neogobius kessleri - Life History/General
78-001694
Neophrynichthys - New Species
78-001920
Neophrynichthys - Taxonomy
78-001920
Nibea albiflora - Sound Production
78-001674
Nibea chui - Distribution/Geographical
78-001850
Nothobranchius guentheri - Diapause
78-001516
Nothobranchius guentheri - Embryology
78-001516
Notopterus notopterus - Taste Reception
78-001373
Notropis anogenus - Aldrin
78-002151
Notropis anogenus - Heptachlor
78-002151
Notropis anogenus - Insecticides
78-002151
Notropis cerasinus - Distribution/Geographical
78-001829
Notropis chalybaeus - Distribution/Geographical
78-001873
Notropis cornutus - Insecticides
78-002094
Notropis cornutus - Malathion
78-002094
Notropis cornutus - Myxosoma notropis
78-001678
Notropis cornutus.....continued
78-001959
Notropis cornutus - Myxosporida
78-001959
Notropis cornutus - Parasites/Diseases
78-001959
Notropis cornutus - Protozoan Diseases
78-001959
Notropis cornutus - Temperature Selection
78-002094
Notropis hudsonius - Chlorine
78-002140
Notropis - Hybridization
78-001618
Notropis lutrensis - Dissolved Solids
78-001656
Notropis lutrensis - Habitat Selection
78-001656
Notropis lutrensis - pH
78-001656
Notropis lutrensis - Temperature
78-001656



Oncorhynchus - Culture/Propagation
78-001288
Oncorhynchus gorbuscha - Age/Growth
78-001813
Oncorhynchus gorbuscha - Culture/Propagation
78-001813
Oncorhynchus gorbuscha - Distribution/Geographical
78-001832
78-001858
Oncorhynchus gorbuscha - Embryology
78-001490
Oncorhynchus gorbuscha - Endocrinology
78-001432
Oncorhynchus gorbuscha - Hormones
78-001432
Oncorhynchus gorbuscha - Population Studies
78-001735
Oncorhynchus - Incubators
78-001288
Oncorhynchus keta - Age/Length Composition
78-001724
Oncorhynchus keta - Bacterial Diseases
78-001947
Oncorhynchus keta - Heavy Metals
78-002085
Oncorhynchus keta - Immunization
78-001947
Oncorhynchus keta - Mercury
78-002085
Oncorhynchus keta - Parasites/Diseases
78-001947

Oncorhynchus keta - Population Studies
78-001735
Oncorhynchus keta - Vibrio anguillarum
78-001947
Oncorhynchus kisutch - Aromatic Hydrocarbons
78-002137
Oncorhynchus kisutch - Bacterial Diseases
78-002146
Oncorhynchus kisutch - Chlorine
78-002140
Oncorhynchus kisutch - Copper
78-002146
Oncorhynchus kisutch - Culture/Propagation
78-001284 78-001286
78-001291
Oncorhynchus kisutch - Electrophoresis
78-001514
Oncorhynchus kisutch - Fertility
78-001284
Oncorhynchus kisutch - Foods/Feeding
78-001806
Oncorhychus kisutch - Growth Stimulants
78-001286
Oncorhynchus kisutch - Heavy Metals
78-002146
Oncorhynchus kisutch - Immune Response
78-001949
78-002146
Oncorhynchus kisutch - Lactate Dehydrogenase
78-001514
Oncorhynchus kisutch - Leaping Behavior
78-001673
Oncorhynchus kisutch - Margaritifera margaritifera
78-001904
Oncorhynchus kisutch - Metabolism
78-001510
Oncorhynchus kisutch - Oil
78-002137
Oncorhynchus kisutch - Olfaction
78-001650
Oncorhynchus kisutch - Parasites/Diseases
78-001939
78-001949
78-001994
78-002146
Oncorhynchus kisutch - Parasitic Molluscs
78-001994
Oncorhynchus kisutch - Pigmenters
78-001291
Oncorhychus kisutch - Testosterone
78-001286
Oncorhynchus - Movements
78-001747
Oncorhynchus nerka - Age/Length Composition
78-001732
Oncorhynchus nerka - Culture/Propagation
78-001285
Oncorhynchus nerka - Digestion Rates
78-001771
Oncorhynchus nerka - Fertilization
78-001285
Oncorhynchus nerka - Fertilization/Soil and Water
78-002241
Oncorhynchus nerka - Foods/Feeding/Selectivity
78-001771
Oncorhynchus nerka - Harvest
78-001732
Oncorhynchus nerka - IHN
78-001976
Oncorhynchus nerka - Karyotypes
78-001611
Oncorhynchus nerka - Management/Research/Lakes
78-001723
78-002241
Oncorhynchus nerka - Mortality Rates
78-001723
Oncorhynchus nerka - Orientation/Homing
78-001611
Oncorhynchus nerka - Parasites/Diseases
78-001976
Oncorhynchus nerka - Population Studies
78-002241
Oncorhynchus nerka - Production
78-001723
Oncorhynchus nerka - Pulp Mill Effluents
78-002159
Oncorhynchus nerka - Variation Studies
78-001611
Oncorhynchus nerka - Viral Diseases
78-001976
Oncorhynchus - Orientation/Homing
78-001747
Oncorhynchus - Parasites/Diseases
78-001974
Oncorhynchus - Predator/Prey Relationships
78-001792
Oncorhynchus - Spawning Migration
78-001747
Oncorhynchus tshawytscha - Age/Growth
78-001808
Oncorhynchus tshawytscha - Blood Chemistry
78-001577
Oncorhynchus tshawytscha - Economic Values
78-002227
Oncorhynchus tshawytscha - Fish Passage
78-002247
Oncorhynchus tshawytscha - Habitat Selection
78-001750
Oncorhynchus tshawytscha - Impingement/Entrainment
78-002247
Oncorhynchus tshawytscha - Lectins
78-001587
Oncorhynchus tshawytscha - Margaritifera margaritifera
78-001994
Oncorhynchus tshawytscha - Maturation
78-001808
Oncorhynchus tshawytscha - Mortality Rates
78-001727

Oncorhynchus tshawytscha - Parasites/Diseases
78-001939
78-001994
Oncorhynchus tshawytscha - Parasitic Molluscs
78-001994
Oncorhynchus tshawytscha - Spawning
78-001750
Oncorhynchus tshawytscha - Stocking/Introductions
78-002227
Oncorhynchus tshawytscha - Stress
78-001577
Oncorhynchus tshawytscha - Swimming Performance
78-002247
Oncorhynchus - Viral Diseases
78-001974
Oncorhynchus - Viral Erythrocytic Necrosis
78-001974
Ophiodon elongatus - Life History/General
78-001660
Opsanus tau - Endocrinology
78-001352
Orthodon microlepidotus - Management/Research/Lakes
78-001730
Orthodon microlepidotus - Population Studies
78-001730
Oryzias latipes - Bioenergetics
78-001459
Oryzias latipes - Coloration
78-001474
Oryzias latipes - Maturation
78-001477
Oryzias latipes - Reproduction
78-001459
Oryzias latipes - Spawning
78-001459
Oryzias latipes - Temperature
78-001477
Osmerus mordax - Chlorine
78-002140
Osmerus mordax - Glugea hertwigi
78-001969
Osmerus mordax - Identification
78-001904
Osmerus mordax - Microsporida
78-001969
Osmerus mordax - Parasites/Diseases
78-001969
Osmerus mordax - Protozoan Diseases
78-001969
Osphronemidae - Air Breathing
78-001386
Osteoglossum bicirrhosum - Air Breathing
78-001406
78-001434
78-001435
78-001443
78-001463
78-001482
Osteoglossum bicirrhosum - ATP
78-001521
Osteoglossum bicirrhosum - Blood Chemistry
78-001406
78-001482
78-001493
Osteoglossum bicirrhosum - Enzymes
78-001434
78-001435
78-001521
78-001576
Osteoglossum bicirrhosum - Excretory System
78-001463
78-001576
Osteoglossum bicirrhosum - Lactate Dehydrogenase
78-001443
Osteoglossum bicirrhosum - Metabolism
78-001492
Osteoglossum bicirrhosum - Osmoregulation
78-001521
Osteoglossum bicirrhosum - Respiration
78-001434
78-001435
78-001443
78-001463
78-001482
Paragalaxias - Taxonomy
78-001915
Paralabrax clathratus - Foods/Feeding
78-001785
Paralabrax clathratus - Habitat Selection
78-001785
Parophrys vetulus - Oil
78-002118
Parophrys vetulus - Parasites/Diseases
78-002006
Parophrys vetulus - Tumors
78-002006
Pelecus cultratus - Fecundity
78-001754
Pelecus cultratus - Spawning
78-001754
Peprilus triacanthus - Life History/General
78-001710
Perca flavescens - Bioenergetics
78-001722
Perca flavescens - Hormones
78-001447
Perca flavescens - Induced Maturation
78-001447
Perca flavescens - Mortality Rates
78-001722
Perca flavescens - Parasites/Diseases
78-001985
Perca flavescens - Population Studies
78-001722
Perca flavescens - Reproductive System
78-001446
Perca flavescens - Steroids
78-001446
Perca flavescens - Temperature Selection
78-001667

Perca flavescens - Trematodes
78-001985
Perca flavescens - Urocleidus adspectus
78-001985
Perca fluviatilis - Acoustico-Lateralis System
78-001558
Perca fluviatilis - Foods/Feeding
78-001777 78-001778
Perca fluviatilis - Fungal Diseases
78-001955
Perca fluviatilis - Henneguya
78-001960
Perca fluviatilis - Myxosporida
78-001960
Perca fluviatilis - Parasites/Diseases
78-001955
78-001960
Perca fluviatilis - Protozoan Diseases
78-001960
Perca fluviatilis - Saprolegnia
78-001955

Percina caprodes - Fecundity
78-001746
Percina - Taxonomy
78-001924
Percina - Variation Studies
78-001924
Petromyzon marinus - Endocrinology
78-001592
Petromyzon marinus - Metamorphosis
78-001549
Petromyzon marinus - Nervous System
78-001517
Petromyzon marinus - Reproductive System
78-001546
Petromyzonidae - Fat Column
78-001550
Phanerodon furcatus - Reproduction
78-001742
Phoxinus phoxinus - Flow Regimes
78-001769
Phoxinus phoxinus - Foods/Feeding
78-001769
Phoxinus phoxinus - Impoundment
78-001769
Pimephales promelas - Acids
78-002117
Pimephales promelas - Alcohols
78-002117
Pimephales promelas - Aldehydes
78-002117
Pimephales promelas - Cadmium
78-002113
78-002148
Pimephales promelas - Chlorine
78-002157
Pimephales promelas - Coal-Conversion Gasifer Condensate
78-002139
Pimephales promelas - DDT
78-002110
Pimephales promelas - Diazinon
78-002078
Pimephales promelas - Enteroviruses
78-001978
Pimephales promelas - Heavy Metals
78-002113
78-002148
Pimephales promelas - Hydraulic Fluids
78-002125
Pimephales promelas - Hydrocarbons
78-002117
Pimephales promelas - Insecticides
78-002078
78-002110
Pimephales promelas - Ketones
78-002117
Pimephales promelas - Parasites/Diseases
78-001978
Pimephales promelas - Phenols
78-002117
Pimephales promelas - Phosphate Esters
78-002125
Pimephales promelas - Population Studies
78-001734
Pimephales promelas - Predator/Prey Relationships
78-002113
78-002148
Pimephales promelas - Production
78-001734
Pimephales promelas - Sewage Plant Effluents
78-002157
Pimephales promelas - Viral Diseases
78-001978
Platichthys flesus - Blood Chemistry
78-001584
Platichthys flesus - DDT
78-002133
Platichthys flesus - Distribution/Geographical
78-001841
Platichthys flesus - Enzymes
78-001584
Platichthys flesus - Insecticides
78-002133
Platichthys flesus - Lipid Composition
78-001507
Platichthys flesus - Osmoregulation
78-001567
Platichthys flesus - Parathion
78-002133
Platichthys stellatus - Aromatic Hydrocarbons
78-002137
Platichthys stellatus - Oil
78-002137
Plecoglossus altivelis - Bacterial Diseases
78-001944
Plecoglossus altivelis - Immunization
78-001944
Plecoglossus altivelis - Parasites/Diseases
78-001944
Plecoglossus altivelis - Territorial Behavior
78-001652
Plecoglossus altivelis - Vibrio anguillarum
78-001944

Pleuronectes platessa - Blood Chemistry
78-001585
Pleuronectes platessa - Cadmium
78-002131
Pleuronectes platessa - Coloration
78-001653
Pleuronectes platessa - Digestive System
78-001574
Pleuronectes platessa - Heavy Metals
78-002131
Pleuronectes platessa - Integument
78-001414
Pleuronectes platessa - Nervous System
78-001574
Pleuronectes platessa - Osmoregulation
78-001585
Pleuronectes platessa - Parasites/Diseases
78-002006
Pleuronectes platessa - Tumors
78-002006
Poecilia latipinna - Myxobolus latipinnacola
78-001971
Poecilia latipinna - Myxosporida
78-001971
Poecilia latipinna - Parasites/Diseases
78-001971
Poecilia latipinna - Protozoan Diseases
78-001971
Poecilia reticulata - Heavy Metals
78-002102
Poecilia reticulata - Integument
78-001369
Poecilia reticulata - Mercury
78-002102
Poecilia reticulata - Osmoregulation
78-001422
Poecilia reticulata - Population Studies
78-002252
Poecilia reticulata - Sperm
78-001444
Poeciliopsis monacha-lucida - Unisex Populations
78-001603
78-001632
Poeciliopsis monacha-occidentalis - Unisex Populations
78-001603
Pollachius virens - Bacterial Diseases
78-001940
Pollachius virens - Parasites/Diseases
78-001940
Pollachius virens - Vibrio anguillarum
78-001940
Polyodon spathula - Harvest
78-002256
Polyodon spathula - Management/Research/Rivers and Streams
78-002256
Polypteridae - Karyotypes
78-001629
Pomadasyidae - Distribution/Geographical
78-001857
Pomadasyidae - Taxonomy
78-001857
Pomadasys commersonni - Foods/Feeding
78-001803
Pomatomus saltatrix - Life History/General
78-001720
Pomoxis - Age/Growth
78-001823
Pomoxis - Condition Factors
78-001823
Pomoxis - Maturation
78-001823
Prionotus scitulus - Foods/Feeding
78-001797
Prosopium williamsoni - Bacterial Diseases
78-001948
Prosopium williamsoni - Gas Bubble Disease
78-001989
Prosopium williamsoni - Parasites/Diseases
78-001948
78-001989
Prosopium williamsoni - Tuberculosis
78-001948
Protomyctophum anderssoni - Early Development
78-001397
Protopterus aethiopicus - Air Breathing
78-001407
Protopterus aethiopicus - Blood Chemistry
78-001407
Protopterus aethiopicus - Gills
78-001375
Protopterus aethiopicus - Respiratory System
78-001375
Pseudopleuronectes americanus - Cardio-Vascular System
78-001515
Pseudopleuronectes americanus - Coloration
78-001354
Pseudopleuronectes americanus - Heavy Metals
78-001439
Pseudopleuronectes americanus - Pigments
78-001354
Pseudotropheus macrophthalmus - Vision
78-001642
Pterogymnus laniarius - Age/Growth
78-001697
Pterogymnus laniarius - Spawning
78-001697
Pterygoplichthys - Blood Chemistry
78-001493
Pterygoplichtys - Blood Chemistry
78-001475

Ptychocheilus grandis - Habitat Selection
78-001638
Ptychocheilus oregonensis - Bioenergetics
78-001722
Ptychocheilus oregonensis - Mortality Rates
78-001722
Ptychocheilus oregonensis - Population Studies
78-001722
Puntius bimaculatus - Foods/Feeding
78-001770
Puntius sarana - Taste Reception
78-001373
Puntius titteya - Foods/Feeding
78-001770
Quietula - Karyotypes
78-001608
Raja clavata - Cadmium
78-002131
Raja clavata - Heavy Metals
78-002131
Raja erinacea - Amino Acids
78-001441
Raja erinacea - Biochemical Composition
78-001565
Raja erinacea - Osmoregulation
78-001441
Rhamphichthyidae - Electric Organs
78-001651
Rhamphichthyidae - Electrical Communication
78-001651
Rhaphiodon vulpinus - Skeletal System
78-001376
Rhinichthys cataractae - Electrophoresis
78-001619
Rhinichthys cataractae - Variation Studies
78-001619
Rimicola muscarum - Foods/Feeding
78-001796
Rohtee alfrediana - Skeletal System
78-001359
Rohtee cotio - Skeletal System
78-001359
Rouleina attrita - Distribution/Geographical
78-001914
Rouleina attrita - Taxonomy
78-001914
Rouleina maderensis - Distribution/Geographical
78-001914
Rouleina maderensis - Taxonomy
78-001914
Rutilus rutilus - Abundance/Factors of
78-001571
Rutilus rutilus - Age/Growth
78-001809
Rutilus rutilus - Asymphylodora kubanicum
78-001988
Rutilus rutilus caspicus - Foods/Feeding
78-001781
Rutilus rutilus - Hybridization
78-001633
Rutilus rutilus - Maturation
78-001571
Rutilus rutilus - Parasites/Diseases
78-001988
Rutilus rutilus - Reproduction
78-001571
Rutilus rutilus - Temperature
78-001809
Rutilus rutilus - Trematodes
78-001988
Salmo clarki - Ammonia
78-002150
Salmo clarki - Blood Chemistry
78-001577
Salmo clarki - Competition
78-001648
Salmo clarki - Gas Bubble Disease
78-001989
Salmo clarki - Habitat Selection
78-001648
Salmo clarki - Mine Effluents
78-002058
Salmo clarki - Nitrite
78-002150
Salmo clarki - Parasites/Diseases
78-001989
Salmo clarki pleuriticus - Taxonom
78-001909
Salmo clarki - Stream Improvement/General
78-002199
Salmo clarki - Stress
78-001577
Salmo gairdneri - Age/Growth
78-001495
78-001813
Salmo gairdneri - Amino Acids
78-001560
Salmo gairdneri - Appetite Stimulants
78-001321
Salmo gairdneri - Aroclor
78-002101
Salmo gairdneri - Aromatic Hydrocarbons
78-002121
78-002144
Salmo gairdneri - Bacterial Diseases
78-001940
Salmo gairdneri - Biochemical Composition
78-001328
Salmo gairdneri - Blood Chemistry
78-001416
78-001453
78-001557
Salmo gairdneri - Cardio-Vascular System
78-001412
Salmo gairdneri - Cobalt
78-001501
Salmo gairdneri - Competition
78-001648
Salmo gairdneri - Copper
78-002120
78-002156
Salmo gairdneri - Culture/Propagation
78-001283
78-001321

Salmo gairdneri.....continued
78-001324
78-001325
78-001327
78-001330
78-001813
Salmo gairdneri - DDT
78-002077
Salmo gairdneri - Diets
78-001324
78-001330
Salmo gairdneri - Endocrinology
78-001495
Salmo gairdneri - Enzymes
78-001582
Salmo gairdneri - Exercise
78-001580
Salmo gairdneri - Feeding Experiments
78-001324
78-001325
78-001327
78-001328
78-001330
Salmo gairdneri - Feeds
78-001325
78-001327
Salmo gairdneri - Gills
78-001412
78-001537
Salmo gairdneri - Habitat Selection
78-001638
78-001648
Salmo gairdneri - Heated Water
78-001283
Salmo gairdneri - Heavy Metals
78-001501
78-002092
78-002103
78-002107
78-002120
78-002127
78-002156
Salmo gairdneri - Hormones
78-001519
Salmo gairdneri - Hydraulic Fluids
78-002125
Salmo gairdneri - Immune Response
78-001453
78-002147
Salmo gairdneri - Immunization
78-001933
Salmo gairdneri - Insecticides
78-002077
78-002086
78-002101
Salmo gairdneri - IPN
78-001977
Salmo gairdneri - Lactate Dehydrogenase
78-001613
Salmo gairdneri - Lead
78-002107
Salmo gairdneri - Liver
78-002101
Salmo gairdneri - Mercury
78-002103
78-002127
Salmo gairdneri - Myxosoma cerebralis
78-001970
Salmo gairdneri - Nitrite
78-002158
Salmo gairdneri - Organophosphates
78-002086
Salmo gairdneri - Osmoregulation
78-001468
78-001537
78-001538
78-001539
78-001542
78-001564
Salmo gairdneri - Parasites/Diseases
78-001933
78-001940
78-001962
78-001970
78-001975
78-001977
Salmo gairdneri - Phosphate Esters
78-002125
Salmo gairdneri - Polychlorinated Biphenyls
78-002101
Salmo gairdneri - Proliferative Kidney Disease
78-001962
Salmo gairdneri - Protozoan Diseases
78-001962
78-001970
Salmo gairdneri - Radionuclides
78-002147
Salmo gairdneri - Reproductive System
78-001582
Salmo gairdneri - Saccus Vasculosus
78-001480
Salmo gairdneri - Salinity
78-001564
Salmo gairdneri - Silver
78-002092
Salmo gairdneri - Starvation
78-001416
Salmo gairdneri - Stress
78-001416
Salmo gairdneri - Thermal Regulation
78-001405
Salmo gairdneri - Tritium
78-002147
Salmo gairdneri - Vibrio anguillarum
78-001940
Salmo gairdneri - Viral Diseases
78-001975
78-001977
Salmo gairdneri - Viral Hemorragic septicemia
78-001975
Salmo gairdneri - Vision
78-001388
Salmo gairdneri - Whirling Disease
78-001970
Salmo gairdneri - Xenobiotics
78-002144
Salmo irideus - Endocrinology
78-001440
Salmo irideus - Hormones
78-001440
Salmo salar - Abundance/Factors of
78-001886
Salmo salar - Age/Growth
78-001813
Salmo salar - Blood Chemistry
78-001454
78-001494

Salmo salar - Cestodes
78-001999
Salmo salar - Competition
78-001791
Salmo salar - Culture/Propagation
78-001289
78-001813
Salmo salar - Dimilin-G1
78-002100
Salmo salar - Eubothrium crassum
78-001999
Salmo salar - Foods/Feeding
78-001791
Salmo salar - Heavy Metals
78-002134
Salmo salar - Insect Juvenile Hormone Analogues
78-002100
Salmo salar - Karyotypes
78-001721
Salmo salar - Lake Culture
78-001289
Salmo salar - Lead
78-002134
Salmo salar - Leaping Behavior
78-001673
Salmo salar - Management/Research/Ponds
78-002263
Salmo salar - Mortality Rates
78-001886
Salmo salar - Movements
78-001760
Salmo salar - Oil
78-002083
Salmo salar - Oil Dispersants
78-002083
Salmo salar - Parasites/Diseases
78-001972
78-001999
78-002004
Salmo salar - Population Studies
78-001729
78-002263
Salmo salar - Recruitment
78-001886
Salmo salar - Stocking/Introductions
78-001729
Salmo salar - Summerkill
78-002072
Salmo salar - Tumors
78-001972
78-002004
Salmo salar - Viral Diseases
78-001972
Salmo trutta - Age/Growth
78-001728
78-001813
Salmo trutta - Cestodes
78-001999
Salmo trutta - Competition
78-001791
Salmo trutta - Copper
78-002120
Salmo trutta - Culture/Propagation
78-001813
Salmo trutta - Eubothrium crassum
78-001999
Salmo trutta - Flow Regimes
78-001769
Salmo trutta - Foods/Feeding
78-001769
78-001791
Salmo trutta - Fungal Diseases
78-001954
Salmo trutta - Heavy Metals
78-002120
Salmo trutta - Herbicides
78-002104
Salmo trutta - Impoundment
78-001769
Salmo trutta - Management/Research/Lakes
78-001728
Salmo trutta - MCPA
78-002104
Salmo trutta - Movements
78-001728
Salmo trutta - Orientation/Homing
78-001670
Salmo trutta - Parasites/Diseases
78-001954
78-001999
Salmo trutta - Population Studies
78-001728
Salmo trutta - Saprolegnia
78-001954
Salmo trutta - Variation Studies
78-001635
78-001636
Salmonidae - Culture/Propagation
78-001287
Salmonidae - Flow Regimes
78-002187
Salmonidae - Fungal Diseases
78-001955
Salmonidae - Gas Bubble Disease
78-002012
Salmonidae - Metabolism
78-001536
Salmonidae - Monosex Culture
78-001287
Salmonidae - Parasites/Diseases
78-001955
78-002012
Salmonidae - Saprolegnia
78-001955
Salmonidae - Sex Reversal
78-001287
Salvelinus alpinus - Age/Growth
78-001813
Salvelinus alpinus - Cestodes
78-001999
Salvelinus alpinus - Culture/Propagation
78-001813
Salvelinus alpinus erythrinus - Ecology
78-001623
Salvelinus alpinus erythrinus - Taxonomy
78-001623
Salvelinus alpinus erythrinus - Variation Studies
78-001623
Salvelinus alpinus - Eubothrium salvelini
78-001999
Salvelinus alpinus - Fungal Diseases
78-001954

Salvelinus alpinus -Parasites/Diseases
78-001954
78-001982
78-001999
Salvelinus alpinus - Saprolegnia
78-001954
Salvelinus fontinalis - Copper
78-002120
Salvelinus fontinalis - DDT
78-002108
78-002109
Salvelinus fontinalis - Diazinon
78-002078
Salvelinus fontinalis - Electrophoresis
78-001606
78-001612
Salvelinus fontinalis - Habitat Alterations
78-002261
Salvelinus fontinalis - Heavy Metals
78-002120
Salvelinus fontinalis - Insecticides
78-002078
78-002108
78-002109
Salvelinus fontinalis - Length-Weight Relationships
78-001824
Salvelinus fontinalis - Management/Research/Lakes
78-002224
Salvelinus fontinalis - Mortality Factors
78-001794
Salvelinus fontinalis - Reproductive System
78-001446
Salvelinus fontinalis - Spring Ponds
78-002261
Salvelinus fontinalis - Steroids
78-001446
Salvelinus fontinalis - Stocking/Introductions
78-002224
Salvelinus fontinalis - Variation Studies
78-001606
78-001612
Salvelinus fontinalis - Predator/Prey Relationships
78-001794
Salvelinus - Karyotypes
78-001631
Salvelinus leucomaenis - Age/Growth
78-001696
Salvelinus leucomaenis - Maturation
78-001696
Salvelinus leucomaenis - Movements
78-001696
Salvelinus malma kraschenninnikovi - Age/Growth
78-001696
Salvelinus malma kraschenninnikovi - Maturation
78-001696
Salvelinus malma kraschenninnikovi - Movements
78-001696
Salvelinus namaycush - Age/Growth
78-001704
Salvelinus namaycush - Copper
78-002120
Salvelinus namaycush - Foods/Feeding
78-001704
Salvelinus namaycush - Heavy Metals
78-002120
Salvelinus namaycush - Management/Research/Reservoirs
78-002225
Salvelinus namaycush - Mortality Factors
78-001794
Salvelinus namaycush - Predator/Prey Relationships
78-001794
Salvelinus namaycush - Spawning
78-001704
Salvelinus namaycush - Stocking/Introductions
78-002225
Salvelinus neiva - Life History/General
78-001718
Salvelinus neiva - Taxonomy
78-001718
Salvelinus - Speciation
78-001631
Saratherodon - Culture/Propagation
78-001298
Saratherodon - Polyculture
78-001298
Saratherodon - Pond Culture
78-001298
Sardinella dayi - Taxonomy
78-001894
Saurida undosquamis - Length Frequencies
78-001826
Scarus croicensis - Spawning
78-001739
Schilbeidae - Fecundity
78-001748
Schilbeidae - Spawning
78-001748
Sciaenidae - Life History/General
78-001715
Sciaenidae - Movements
78-001715
Sciaenops ocellata - Sound Production
78-001647
Sciaenops ocellata - Spawning
78-001647
Scomber japonicus - Abundance/Factors of
78-001733
Scomber japonicus - Age/Growth
78-001684
Scomber japonicus colias - Heavy Metals
78-002057
Scomber japonicus colias - Zinc
78-002057
Scomber japonicus - Distribution/Geographical
78-001833
Scomber japonicus - Management/Research/Marine
78-001733
Scomber japonicus - Recruitment
78-001733
Scomber japonicus - Spawning
78-001684

Scomber scombrus - Distribution/Geographical
78-001833
Scomberomorini - Taxonomy
78-001907
Scomberomorus brasiliensis - New Species
78-001903
Scomberomorus cavalla - Life History/General
78-001686
Scomberomorus maculatus - Life History/General
78-001685
Scombridae - Baits/Baiting
78-002236
Scombridae - Longlines
78-002236
Scophthalmus maeoticus maeoticus - Endocrinology
78-001600
Scophthalmus maeoticus maeoticus - Reproductive System
78-001600
Scophthalmus maximus - Coloration
78-001653
Scophthalmus maximus - Parasites/Diseases
78-002006
Scophthalmus maximus - Taste Reception
78-001512
Scophthalmus maximus - Tumors
78-002006
Scorpaena porcus - Biochemical Composition
78-001594
Scorpaena porcus - Endocrinology
78-001547
Scorpaena porcus - Excretory System
78-001594
Scyliorhinus canicula - Blood Chemistry
78-001421
Scyliorhinus canicula - Catecholamines
78-001423
Sebastes diploproa - Habitat Selection
78-001639
Sebastes - Habitat Selection
78-001654
Sebastes - Identification
78-001845
Sebastes mystinus - Foods/Feeding
78-001785
Sebastes mystinus - Habitat Selection
78-001785
Sebastes paucispinis - Henneguya sebasta
78-001963
Sebastes paucispinis - Kudoa clupeidae
78-001963
Sebastes paucispinis - Myxosporida
78-001963
Sebastes paucispinis - Parasites/Diseases
78-001963
Sebastes paucispinis - Protozoan Diseases
78-001963
Sebastes serranoides - Foods/Feeding
78-001785
Sebastes serranoides - Habitat Selection
78-001785
Semotilus atromaculatus - Life History/General
78-001687
Semotilus corporalis - Spawning
78-001752
Seriola - Bacterial Diseases
78-001946
Seriola - Immunization
78-001946
Seriola - Parasites/Diseases
78-001946
Seriola quinqueradiata - Age/Growth
78-001815
Seriola quinqueradiata - Blood Chemistry
78-001528
Seriola quinqueradiata - Kudoa pericardialis
78-001968
Seriola quinqueradiata - Parasites/Diseases
78-001968
Seriola quinqueradiata - Protozoan Diseases
78-001968
Seriola quinqueradiata - Temperature
78-001815
Seriola - Streptococcus
78-001946
Serranidae - Life History/General
78-001717
Serranidae - Morphology
78-001912
Serranidae - Population Studies
78-001717
Serranidae - Taxonomy
78-001912
Serranus incisus - New Species
78-001902
Sillago sihama - Culture/Propagation
78-001316
Silurus glanis - Life History/General
78-001681
Solea solea - Coloration
78-001653
Sparus aurata - Abnormalities
78-001384
Sparus aurata - Hormones
78-001430
Sparus aurata - Reproductive System
78-001430
Sparus aurata - Steroids
78-001430
Spicara smaris - Biosorption
78-001601
Sprattus fuegensis - Foods/Feeding
78-001418
Sprattus fuegensis - Metabolic Rates
78-001418
Squaliolis - Bioluminescence
78-001921

Squaliolis - Ecology
78-001921
Squaliolis - Morphology
78-001921
Squaliolis - Taxonomy
78-001921
Squalus acanthias - Bioenergetics
78-001413
Squalus acanthias - Blood Chemistry
78-001489
Squalus acanthias - Cardio-Vascular System
78-001489
Squalus acanthias - Hypoxia
78-001489
Squalus acanthias - Metabolic Rates
78-001413
Squalus fernandinus - Nervous System
78-001380
Squalus - Taxonomy
78-001919
Stenotomus chrysops - Life History/General
78-001708
Stizostedion vitreum - Hormones
78-001447
Stizostedion vitreum - Induced Maturation
78-001447
Stizostedion vitreum vitreum - Commercial Fishing
78-002254
Stizostedion vitreum vitreum - Management/Research/Lakes
78-002254
Stizostedion vitreum vitreum - Population Studies
78-002254
Stolephorus commersonii - Parasites/Diseases
78-001981
Stolephorus commersonii - Parasitic Copepods
78-001981
Stolephorus commersonii - Peroderma tasselum
78-001981
Stolephorus purpureus - Culture/Propagation
78-001319
Stolephorus purpureus - Holding Facilities
78-001319
Stolephorus purpureus - Stress
78-001319
Stolothrissa tanganicae - Age/Growth
78-001811
Stolothrissa tanganicae - Mortality Rates
78-001811
Stylephorus chordatus - Foods/Feeding
78-001793
Stylephorus chordatus - Mouth Parts
78-001793
Symbranchus marmarotus - Air Breathing
78-001460
Symbranchus marmarotus - Respiration
78-001460
Syngnathus parvicarinatus - New Species
78-001905
Syngnathus sauvagei - Taxonomy
78-001905
Tautogolabrus adspersus - Oil
78-002130
Tetrapturus angustirostris - Distribution/Geographical
78-001865
Theragra chalcogramma - Fecundity
78-001757
Theragra chalcogramma - Meristic Studies
78-001624
Theragra chalcogramma - Mortality Factors
78-002074
Theragra chalcogramma - Population Studies
78-001624
Theragra chalcogramma - Spawning
78-001757
Theragra chalcogramma - Variation Studies
78-001624
Thymallus arcticus baicalensis - Metabolic Rates
78-001575
Thymallus arcticus baicalensis - Swimming Performance
78-001575
Thymallus arcticus baicalensis - Temperature
78-001575
Tilapia aurea - Foods/Feeding/Selectivity
78-001801
Tilapia - Competition
78-001726
Tilapia - Filming Amine
78-002119
Tilapia leucosticta - Contracaecum
78-002003
Tilapia leucosticta - Nematodes
78-002003
Tilapia leucosticta - Parasites/Diseases
78-002003
Tilapia - Morpholine
78-002119
Tilapia mossambica - Carotenoids
78-001506
Tilapia mossambica - Coloration
78-001506
Tilapia mossambica - Endocrinology
78-001554
Tilapia mossambica - Reproduction
78-001554
Tilapia nilotica - Culture/Propagation
78-001299
Tilapia - Population Studies
78-001726
Tilapia - Power Plant Effluents
78-002119
Tilapia - Status/California
78-001856
Tor khudree - Taste Reception
78-001373
Torpedo californica - Electric Organs
78-001767
Torpedo californica - Foods/Feeding
78-001767

Torpedo marmorata - Hypoxia
78-001470
Torpedo marmorata - Metabolic Rates
78-001469
Torpedo marmorata - Respiration
78-001469
Toxotes chatareus - Auto-shaping
78-001679
Toxotes chatareus - Foods/Feeding
78-001679
Toxotes chatareus - Spitting
78-001679
Trachelyichthys exilis - New Species
78-001910
Trachurus mediterraneus ponticus - Biosorption
78-001601
Trachurus trachurus - Reproductive System
78-001382
Trigla capensis - Age/Growth
78-001698
Trigla capensis - Spawning
78-001698
Trinectes maculatus - Predator/Prey Relationships
78-001805
Triportheus angulatus - Metabolic Rates
78-001464
Triportheus - Lipid Metabolism
78-001533
Tydemania navigatoris - Foods/Feeding
78-001787
Wallago attu - Biochemical Composition
78-001479
Xiphias gladius - Heavy Metals
78-002098
Xiphias gladius - Mercury
78-002098
Xiphias gladius - Selenium
78-002098
Xiphophorus maculatus - Coloration
78-001588
Xiphophorus - Parasites/Diseases
78-001986
Xiphophorus - Tumors
78-001986
Zoarcidae - Haemogregarina
78-001964
Zoarcidae - Parasites/Diseases
78-001964
Zoarcidae - Protozoan Diseases
78-001964

☆ U.S. GOVERNMENT PRINTING OFFICE: 1978—777-122/8

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
EDITORIAL OFFICE
AYLESWORTH HALL, CSU
FORT COLLINS, COLORADO 80523

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF THE INTERIOR
INT 423

THIRD CLASS BOOK RATE

LIBRARY
NATL MAR FISH SERV
PO BOX 3830
HONOLULU, HI 96812

S26126

To make an address change, we must have both your former address exactly as it appears on your mailing label, including the computer ID number, and your new address, which should be as concise as possible.